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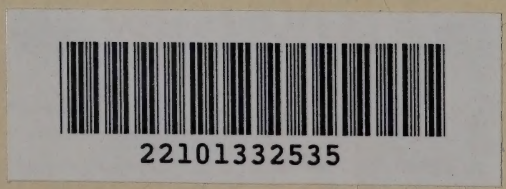

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THE

PRINCIPLES AND PRACTICE

OF THE

WATER CURE.

Drawn by H. Lamb.

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Dr Wilson's Water Cure Establishment.

GREAT MALVERN.

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THE

PRINCIPLES AND PRACTICE

OF THE

WATER CURE:

AND

Household Medical Science:

IN CONVERSATIONS

ON PHYSIOLOGY,

ON PATHOLOGY, OR THE NATURE OF DISEASE,

AND ON

DIGESTION, NUTRITION, REGIMEN, AND DIET.

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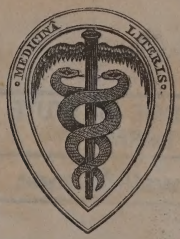

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PREFATORY CONVERSATION WITH A READER.

READER.—I should be glad to have a chat with you, *de omnibus rebus*, I mean about water-cure matters in general, and a few words about your book and self in particular.

DOCTOR.—With pleasure, on any subject you please. Our conversation shall stand as a *preface*. The form of dialogue has already given me much facility in introducing matters I wished to touch upon, and I only hope it will assist your attention, and help you on in the perusal, as much as it has me in the writing.

R.—Let us talk then—if thoughts had been enough, sweet speech had been denied us. I have just skimmed through your work; it's a *big* book.

DR.—My desire has been to give you a comprehensive idea of LIFE, of the HUMAN BODY and its maladies, and of the WATER-CURE; and I trust when you have read the work carefully, you will think it a *bigger* book, that is, when its teachings have had time to produce their commentaries in your mind. It is, in a great measure, intended for non-professional persons like yourself, who thirst for knowledge, and only require to be led into the right path to instruct themselves in these matters, often of *vital* importance. Let me hope, that it will induce you to look into the many excellent works written with a similar design. I am not without the pleasing anticipation that my book will be acceptable to many medical men, who have neglected, or for a long time have given up reading. I am firmly impressed with the conviction, that if mankind are to be more signally benefited by MEDICINE, as a science or as an art, than has been the case, it will be when its practitioners shall cease to be "mystery-men," or write merely for the profession—when they shall more generally exercise the highest function of their calling—viz., to teach the *people*, how to avoid disease, by unfolding its *causes*, its *sources*, and its *remedy*.

R.—You have now had above a dozen years of practical experience of the working of this new system. I should like to know what is your private opinion of its progress and prospects?

DR.—The WATER-CURE is now slowly but steadily emerging from the

ordeal of obloquy and opposition it is the fate of all new truths, all innovations that thwart public prejudices or interfere with party interest, to pass through. Neither the *facts* of cure, nor the explanations of theory, have ever yet been confuted, either by private writers, or by the avowed organs of the profession. It has come to this, that, as has been the case with all kindred improvements in art or science heretofore—when the truth of what is *new* can no longer be doubted, the last resource of sophistry or *ill-will* vents itself in *personal* abuse of its advocates, or is shown by captiously challenging its novelty. It is all but waste of time to heed such disputants; but more of this anon. The great superiority of the water-cure, taking it as a whole, over every other system hitherto practised, will in due time gain for it a popularity which nothing can shake, and promises curative results never before realised in the history of the healing art. Every week, every month, and every year are multiplying fresh trophies of its power, evidences at once of its *efficacy* and its *safety*, and I have no doubt will call forth from the ranks of the profession many zealous and learned partizans, to fight its battles, and to stake their character and fortunes on its truth.

R.—From all I have heard from patients, and the little I have read, I am beginning to feel prepossessed in its favour, and believe that the announcement you have just made is not without a reasonable and common sense foundation. Favour me then with anything more you may have to say that will elucidate the matter to my unprofessional mind.

Dr.—I have already, in the work before you, endeavoured to explain that the pretensions of the water-cure are supported,

1. By its strict accordance with the ascertained chemistry of life and phenomena of disease—the facts of physiology and pathology.

2. By the peculiar fitness of its agency to fulfil the ends and indications of treatment which our more mature knowledge of health and disease points out.

3. By a strong array of unquestioned and unquestionable *facts*, cases of cure, and cases of relief, where cure was considered *hopeless*, and relief appeared *impossible* by the best remedies of drug-medical practice.

The paramount error of all medical treatment hitherto has been, to do too much or to do too little—either to leave morbid processes unchecked or unmitigated—as in the purely expectant method, that is, by leaving nature to her own resources; or by *incessant* or alternate depletions and stimulations by bleeding, blistering, and drugging, as in the revulsive method; to leave no place, or hardly any place, for nature to do her own work;—at once to baffle her sanative operations, and to diminish the powers of resistance, by undermining the constitutional stamina, to which she trusts for carrying her subject through tedious morbid processes;—or, if a present recovery is accomplished, to do it at the expense of an increased liability, in too many cases of an actual foundation laid, for *future*

maladies. Under the water-cure, its safe, salutary, and nature-like treatment, things are differently managed. No exhausting depletions are permitted. The life-blood is not drained. The delicate organization of the mucous membranes and sensitive surfaces of man's inner parts, the core of man's vitality, and the sources of his restoration, are respected. All *internal irritation* by drugs that might *divert* the sanatory actions of the economy, is carefully avoided.

R.—I think I perceive where this argument must lead to.

Dr.—Surely, and the *best men* in the profession are beginning clearly to see their difficulty. Of all parts of man's curiously wrought mechanism, the stomach and bowels deserve the first to be rescued from the agencies of disorder, and to be maintained intact and unimpaired. In their integrity lies the greatest chance of salvation for the diseased body. Instead of this, by internal medication, morbid causes resident in the digestive organs, are often tenfold aggravated and confirmed; because the already suffering stomach is further abused by being made the vehicle of irritating medicines, that even in a state of health outrage its sensibilities and overwhelm its functions. The heaviest blow and greatest discouragement to nature, that can be inflicted, is by *exclusively* making the stomach and bowels the field of warfare against disease, and therefore, full often leaving this centre of health and vitality, a scene of medicinal carnage and incurable disorder.

The skin and lungs, nature's great eliminators, evacuating more worn out elements or morbid materials than the bowels and kidneys—these, with the digestive organs, receive the water-doctor's first attention, as, with their restored integrity of function, few diseases, if any, can linger in the system, or long baffle the practitioner. The salutary and cleansing effect of pure water, taken as a remedy internally, I have already sufficiently explained; then comes the pleasure, under our system of treatment, of being *enabled* to take sufficient exercise, with the zest given to the daily routine by the exhilaration consequent to the frequent bathing! Add to this, the thorough relish of three plain and substantial meals a day—the copious relief from the alimentary canal which follows with certainty after breakfast, and the sound and refreshing sleep. It is easy to conceive the effect on the *nervous system*, and therefore on the whole organism of a daily repetition of this pleasurable routine; namely, the making of a *rich blood*—the acquisition of *solid flesh* and strength, the elasticity of physical feeling, the buoyancy of spirits, and the vigour of mind, which impart to the patient a consciousness of renovated existence—in common parlance, of a new lease of life.

R.—I, as a mere tyro, quite appreciate the value of such a system, were it only as a routine; it sounds like getting into health naturally and physiologically. Pray continue.

Dr.—The phenomena of the generation of animal heat helps, in some

measure, to explain the rapid cures both of acute and chronic diseases accomplished by the water treatment. The *vital changes of matter* within the system are the necessary conditions to the development of animal heat. It is a law of chemistry, that when bodies enter into new states or combinations, when changes are effected in their composition, or in the arrangement of their ultimate particles, *heat* is evolved. Such changes cannot take place without heat being set free. It is the same with the living body. The more the body is duly and justifiably tasked to develope its animal heat, the more rapid and extensive are the transformations of the structure,—old materials are thus broken up, and enter into combinations with the oxygen of the air, which removes them out of the body; or they are *drained off* by the other excernent outlets. The result of this state of things is, that the powers of nutrition are largely called upon, to supply *new materials* to repair the extra waste. *Absorption* is increased. *Digestion* is promoted. *Assimilation* is quickened; and a corresponding activity reigns in all the functions. *Vitality*, in short, is augmented. The constitutional powers are in a manner renovated. The poor dejected dyspeptic, with pallid skin, weakened limbs, and shattered nerves, is often, in a few short weeks, transformed into a man of strength of body and decision of character; the dyspeptic stomach is incommoded *now* by no food; the paralysed, gouty, or rheumatic limb is set free; the prostrate fever patient is saved, with a *short* convalescence, and in many cases, the man smitten with an apoplectic stroke, is recovered as if "by miracle." This description of the effects of the water-cure is not hyperbolical, but is realised in the experience of those who treat patients on the new system.

The exercise enjoined, the water-drinking prescribed, and the frequent abstractions of heat by the various baths, under the water regime, promote very essentially the rapid change of matter, in the due activity of which health consists, the worn out tissues are more speedily broken down and removed from the system, and greater place is left for the substitution of healthy for unhealthy structure. Hence four great points are gained for the invalid:—1. The ability to do with much less clothing; and 2. The power of converting to nutrition additional supplies of food. 3. The greater play for the functions of the lungs, the capability of receiving into the system additional *oxygen*, and of excreting additional *carbon*. 4. As the result of all, an increase of muscular strength, of nervous power, and of mental energy.

As to the special or *artistic* processes of the water-cure, they are capable of being so handled and modified as to produce much more effectively, promptly, and safely, the peculiar agency often falsely claimed for drugs. The organic action that is too weak, is exalted by the most powerful, yet the least noxious of all stimulants. The organic activity, on the other hand, that is too strong, is quieted down or depressed by the safest, and

most easily graduated, of all sedatives. One simple agent—pure water—*properly modified* in its appliances by the water-cure processes, and effectively wielded, is found capable of attaining nearly every end that can be desired, or that is practicable in the treatment of disease. *The foundation of the water-cure is the admitted fact that it is not art or its implements, neither physic nor the physician, but the innate powers and properties of the organism, the vis medicatrix naturæ, exerted with the least impediment from injurious agencies from without or within the body, that stay the progress of disease, and repair its ravages.*

The principles of Physiology, Pathology, and Therapeutics, on which the water-cure is founded, and the received theories of the functions of health and of the actions of disease, may be easily grasped by your mind as an unprofessional man. They satisfactorily account for the extraordinary cures, as they explain the *modus operandi* of the water-cure practice. I will state them in this simple way, it may assist you when you reperuse my work.

Organized structure is continually wasting, and is as continually renewing. The very play of its functions wears down its materials, and exhausts its vitality: renovation is appointed and sought for in *food*, *water*, *air*, and *rest*. To introduce the new materials, those of *supply*, and to give exit to the old materials, those of *waste*, a digestive apparatus and lungs are necessary on the one hand, and a system of eliminating organs, instruments of excretion or evacuation, are indispensable on the other. The change of matter from dead to living, and again from living to dead, the alternate or simultaneous decomposition and recomposition of structure, is the fundamental characteristic of animal life.

The derangement of the balance between *supply* and *waste*, the one in *excess* or *defect* relatively to the other, in the whole or in *any part* of the system, is the most tangible idea that I can give you of the state called DISEASE. In the spontaneous efforts of the functions to restore this balance, that is, to equalize waste to supply, and supply to waste, in the whole or in a part, consists the self-preservative power of the organism,—the *vis medicatrix naturæ*. Inasmuch as these efforts are often inadequate or shackled, the resources of the medical practitioner are called in to second nature, to remove the obstructions in her way, to stimulate her flagging energies, to restrain her too impetuous efforts, or to recall her deviations into the right path.

The processes of *supply* and *waste* are carried on in the *capillaries*, minute hair-like tubes, which are the terminations or prolongations of the arteries and veins. The *tone* of these capillaries, that is, their due contractile power, depends on the integrity of the *organic nerves* which supply them. Any cause that impairs this nervous energy diminishes the contractile power of the capillaries. Their diameter expands; their walls relax. Hence the volume of blood in them is increased and its current

slackened. These are the characteristic features (technically the *proximate causes*) of the morbid states denominated *congestion* and *inflammation*. The *immediate result* of this state of things, in any part of the animal structure, is disturbance of its functions, the *ultimate* consequences are *organic alterations*, either a softening or a hardening of the affected tissues, a drying up, or a profusion, or an *acridity* of the usual secretions,—an undue absorption or deposition in parts, or nerves rendered either too sensitive or too blunt,—in short, the balance between *waste* and *supply* which constitutes health is lost. The loss of this equilibrium, and the *impairments of function*, or *alterations of structure* flowing therefrom, constitute DISEASE. The *diversity* of these alterations determines the *specific varieties* of disease. This is *about* the shortest and plainest account of the matter that I can give you who are not versed in the technicalities of physiology and pathology.

The diminished action of the capillaries of a morbid locality is associated in all acute, and in many chronic diseases, with an excitement of the nervous centres, and of the circulating system. This constitutes the state called *fever*, the constitutional disturbance induced by any impaired tissue or vitiated system of the economy. The effect of the continuance of this general excitement is to use up and exhaust the vital endowments of the structure, that is, to diminish their irritability and sensibility, to produce sooner or later exhaustion, and then death.

The *organic nerves*, that is, the nerves that preside over the vital and *involuntary* functions, circulation, respiration, digestion, absorption, assimilation, secretion, are the first implicated in diseased action, the first parts of the living machinery whose energy is impaired. The capillary vessels over which they preside, feel, of course, the withdrawal of a wonted and necessary stimulus. Their tone is destroyed, their walls relax, the blood in them accumulates, the surrounding tissues redden and dilate. The tender extremities or radicals of the sensitive nerves are pressed upon, their sensibility is exalted. The *chemical* or *destructive action* prevails over the *vital* or *conservative;* the change of living into dead matter is greater than the repair, and the heat of the part is accordingly augmented. Consumption of the part goes on rapidly. A great, an unusual development of animal heat takes place as the result. Hence we have all the characteristics of inflammation—*redness, swelling, pain, heat.*

To rescue the body from these states of disorder, to *set* to rights these deranged organic nerves, to rectify these impaired capillary vessels, to remedy local congestions and inflammation, to equalize the circulation of the blood, to diminish excited sensibility, to correct morbid secretions, and to curb or to spur excessive or defective constitutional action, constitute the *whole art of healing*. To attain these objects is the be all and end all of all the countless remedial agents—the sum total of therapeutics.

All the resources and implements of the art of medicine, whether

drugs, bleeding, blistering, irritating ointments or *lotions, issues, setons,* are all reducible, in their ultimate action, to the simple and unique object of increasing the tone of the nerves and capillaries. Their aid is employed either to stimulate deficient action, or to restrain excessive action. Hence they are all resolvable *en dernier analyse* into the two grand heads of *stimulants* or *sedatives*. *Physic* acknowledges no other objects. When it has gained these ends it has discharged its functions. The ministry of the medical practitioner has then done its utmost. The rest is left to nature. If the needful aid be not too long delayed, she will soon restore the balance of waste and supply; the general harmony and easy play of all the functions—the well-being of body, and the elasticity of spirit, which constitute health.

The best stimulants are those that most powerfully and speedily excite without exhausting the nervous centres. *Alcohol* or *intoxicating drinks,* and *opium,* strongly excite, but these *exhaust nervous power,* as well as muscular activity. Neither are they immediate in their action; we must often wait for their absorption into the circulation. The *temporary increase* of nervous energy is more than compensated by the corresponding *torpor* and *collapse* that follow; not to speak of the positively *noxious materials* introduced into the circulation, which go to poison the fountains of health, gratuitously expend the vital energy, and to produce also a great variety of *chronic* and *acute diseases.*

Far different in its operation from all this is the stimulus of water, it produces a permanent exaltation of the vital energies, without any morbid collapse. The impression of cold water on the nervous extremities on the surface of the body produces a strong sensation at the *nervous centres,* a stimulation augmenting nervous energy beyond any other stimulant; not to speak of its salutary effects on the *skin,* promoting its *capillary circulation,* and favouring its *exhalations.*

The aid of sedatives is required in the commencement of acute diseases to reduce excessive vascular action or nervous excitement. They are technically called *antiphlogistics,* as removing the corporeal conditions of inflammation. The sedative action of water, as it is applied by the experienced and educated Water-Doctor, can be *demonstrated* to be the most powerful antiphlogistic. It promptly allays morbid sensibility; it *constringes the capillaries,* and compels them to urge on their contents; it thus diminishes the vascular fulness of local inflammations and congestions, and moderates the excitement of the heart and arteries, that accompany and keep up the local mischief.

In the exclusive, combined, or alternate use of *stimulants* and *sedatives,* consists the whole "*art* and *mystery*" of physic.

That drugs are found but *very imperfectly* to attain these ends is confessed by the constant *search* after *new specifics,* and the *eager modification of old remedies.* The practitioners who wield the simple but mighty

remedial powers of water, profess to have found the object so long and in vain sought after.

The grand desideratum of medical science, as well as the longing desire of humanity, is a remedy easy to procure and safe to administer, which may be so *modified* in its appliances, as unerringly to bring about every degree of stimulation or sedation required in the treatment of disease. On the score of power, certainty, and safety of action, in the attainment of these ends, our water-cures exemplify the superiority of our remedial measures in the majority of cases, over any and all of the ten thousand articles and compounds of the Pharmacopœia.

The very simplicity of the water-cure agency, and the fewness of the tools worked with, demand the greater skill in the workman. To treat disease with success, not only must the *original causes* of the malady *cease to operate*, but the action of water in its varied applications must be thoroughly comprehended, the power of reaction and the stamina of the constitution must be accurately measured; the nature, extent, and locality of disease exactly appreciated by the scientific modes of diagnosis; both the eye and the ear must be trained to detect and read the alterations of the outward man, the changes of physiognomy, attitude, gait, air, or utterance, which bespeak the varied phases of disease.

R.—I am beginning to understand the firm basis on which your arguments repose; but are not the great benefits claimed for the water-cure rather over-stated, as I have heard?

Dr.—I do not think so; the over statements have been on the part of its detractors. Still, in all matters, it is always prudent and wise to leave a margin for the exaggerations of the advocate, the prepossession of the zealous convert, or the often unconscious leanings of interest.

R.—You lay much stress, I perceive, on its *safety* and *simplicity*.

Dr.—The dangers of the water-cure are a mere bugbear, and only attach to its administration by incompetent persons. Even then, I can prove to any intelligent person, that the mischief that may accrue is *infinitely less* than what takes place *every day* under drug administration in licensed hands.

R.—I find in your disquisitions on disease and water-curing, you have called the humoral pathology to your aid. Tell me something more about it.

Dr.—Disease cannot be explained without it. The *humoral pathology* is no fiction or mere idealism. Modern chemistry has shown how suspended secretions and retarded excretions, vitiate and poison the general circulating mass of fluids, and in this way impair the integrity of the solids. In proportion as the circulation is languid or arrested in a part, the due chemical decompositions of the blood, and change of vital structure and the removal of waste structure, are prevented or impeded. Hence these retained matters impair the general integrity of the circulating mass.

The *blood* is a vital fluid. Moses declared it to be *the life.* The vitality, however, is only retained so long as it is in the living vessels, and under the influence of the *nerves of organic life,* which preside over the vessels. When it is drawn from a vein into a basin, it soon separates, forming a firm clot floating in the serum or watery part. This separation is the last act of its vitality. The precise degree of its *vitality* also is regulated by the amount of vitality existing in the organic nervous system and vessels. In the state of these nerves and vessels is to be sought and found the explanation of the *phenomena of disease.* The controlling nervous energy residing in the vessels may be impaired or destroyed in a variety of ways. 1st. Through simple excess of blood in the system. 2nd. Through simple deficiency of blood. 3rd. Through poisonous matters absorbed into the circulation. 4th, and lastly. Through influences that primarily act on the organic nerves, paralysing more or less their energies. In these ways is diseased action established in the animal system ; apart from these we can have no idea of the existence of diseased action in the living organism.

Whatever lessens the energy of the organic nerves, lessens the intrinsic vitality of the blood. This truth cannot be too much kept in mind. With lessened vitality comes of necessity lessened power of resistance to the causes of derangement, disease, and death.

The chemical analysis of *dead* blood can predicate nothing certain of the properties of the living circulating fluid. As well expect to affirm what qualities of soul a man had by examining his headless trunk. If the true properties of living blood are to be accurately investigated, they are only likely to be got at while it is in its own vessels. The essence of the vitality of the blood lies no doubt in the innumerable *globules* which are held in solution in the *serum* or watery part. The serum can be considered in no other light than as a mere aqueous menstruum in which to float and circulate withal the globules. *Letting blood* is, therefore, *draining a man of his vitality,* and was a barbarous proceeding in the way it used to be practised ; it was as sane a proceeding as battering the walls of a house, and mining its foundations, in order to kill vermin in the cellars, or to extinguish a fire in the attics. *Letting heat,* by the sheet packing and friction in the shallow-bath, *is like drowning both the one and the other, without injury to the building.*

R.—I have also been highly interested by what I hastily read in your book about the *cells* and *blood globules,* I should like to hear any additional remarks on the latter, as well as on the "humours," you may have to make.

Dr.—It is a great law of nature, that *the germs of all vitality—the elementary principles of living beings,* from the seeds of plants to the ova of animals, *are contained in investing membranes!* The *final* cause of this, no doubt, is to insure all such *germs* against the results of their con-

tamination by commingling with foreign, incompatible, or denaturalizing principles in the circulating fluids of the animal, or in the soil or matrix on which they are deposited, and wherein they are destined to grow. The *blood-globules*, being the vital parts of the circulating fluid, and containing the germs of every corporeal structure, *are not exceptions to this law*. They are protected by the same expedient, a membranous covering, from the injury they might sustain from circulating in immediate contact with foreign or noxious elements. Without such a guard as this, the *fountains* of life would be constantly liable to be poisoned. But this is only one of many beautiful provisions which physiology teaches us, the Divine Architect of our frames has had recourse to, *with even a studious care*, to prevent the *sacred principle of life* from being vitiated and denaturalized by anything foreign to itself. Otherwise half compounds of life, half compounds of *something else*, would be of daily occurrence. MONSTROSITY is not the consequence of *perverted life in itself*, but of its *perverted development*. Man, by injuring his organism, weakens its vitality, and he transmits that weakened vitality to his offspring. He transmits also his organic peculiarities, that is, the predominance of certain of the *fundamental structures* of his frame, as a *highly developed*, and therefore *morbidly sensitive* nervous system, in other words, *a nervous temperament*, and the *tendencies* such a temperament inherits, or a developed muscular system, or vascular system, or cellular system, all of which are the foundations of the temperaments philosophically analysed. *But vitiated fluids man does not, cannot transmit.* Nature, as has been seen, has too securely guarded the sacred precincts of life, to permit this result. Even when his fluids reach that point of contamination that the vital principle languishes, his power of *transmitting* his feebleness ceases. The tendency to gout, to insanity, to cancer, &c., is propagated not through the medium of any gouty, insane, or cancerous *humours*, as is popularly credited, but by the transmission of certain predominant organic structures and tendencies. The *evil humours* of the man, therefore, are *his own acquisition*, not *his inheritance ;* and *they die with him*, if not removed by the power of healing. This, it appears to me, is the splitting and exact apportionment of the truth between the partizans of the *solid* and those of the *humoral* theories of disease. The bearings of the *portions of truth* that belong to both parties have received further development in the work before you.

R.—I remember one of the principal objections I heard against your *system* was that it diluted and impoverished the blood.

DR.—From what I have said of the nature and office of the blood globules, it will be at once apparent to you, that no matter what quantity of water may be drunk and absorbed into the circulating system, it cannot injure their integrity, nor even diminish their relative amount. Hence the futility of the medical objection that "*water thins the blood.*" The class

or cast of practitioners that could urge such an objection, must bring themselves into suspicion of their honesty, contempt for their ill-will, or commiseration for their ignorance. Only a given amount of water can be *detained* in the vessels. This is, 1st, partly for the simple purpose of bulk, to afford one of the necessary conditions for calling into play the contractions of the vessel; and, 2ndly, partly as a mere diluent and vehicle of circulation, a menstruum in which to dissolve and carry out of the body foreign or noxious elements introduced by diet, drinks, or drugs, into the current of the circulation.

Water, therefore, never *mixes* with the blood globules, never can incorporate with them, nor break them up. Their electrical * affinities and relations may be altered. They may cohere one to another, but they cannot incorporate while in their vessels. In morbid stasis or arrest of blood, (congestion) they cohere. The vital controlling power (the organic nerves) that maintains to each globule its due charge of electricity is repressed or depressed for the time. With the exaltation of the nervous power, by-and-by their normal vital properties are restored, and the circulation is re-established. By a *lightning stroke* they are killed, their electricity is discharged off, nor is enough left to make them cohere, and form a clot either in the vessels of the dead body, or when drawn away from it. All other blood when drawn from the body coagulates; firmness of clot is in proportion to the exaggerated or lessened vitality of the individual. In malignant fevers, in ague, in cholera, &c., the vital endowment of the organic nerves is lessened or destroyed, and the amount of electricity with which they are charged almost null. The repulsion between them ceases

* Whatever changes the chyle may experience in the *lacteals* and *thoracic duct*, certain it is that once introduced to the lungs, it *there* acquires the *red* investing membrane of its globules, and the highly vital properties that characterise it while coursing in the arteries. This colouring matter of the blood, you must remember, is *iron*, the element *par excellence* endued with *magnetic properties*. Hence the peculiar adaptedness of this covering to shield the vital globules, to enable them to repulse all contact with extrinsic and uncongenial matters, and to retain such affinities with the intrinsic and congenial structures, as it shall easily coalesce and amalgamate with them, whenever the wasted particles of the body call for new vital deposit. By the discharge of their electricity, the globules lose their tunics, and leave their rudimentary state, and so become incorporated with the living fabric, in the same way as its elementary gases unite by electrical discharge to form water. The *iron* of the blood, like its phosphorus, its sulphur, &c., is a product of the vital economy from its elements introduced into the food. Most probably it is elaborated in the lacteal vessels and glands, where evidently a higher vitality is given to the absorbed chyle, which vitality is at length consummated or perfected, when the chyle mixes and becomes one with the blood in the heart and lungs. What becomes of the *iron*, on the expulsion of the blood globules to unite with the tissue needing repair, it is hard to say. Probably in another shape, or in other elements, it may go to form the new structure. The destiny of the oxygen with which the iron was combined (the peroxyde) is clearer. It unites with the liberated carbon and hydrogen of the decomposed structure forming carbonic acid and water.

more or less, in other words, the *blood globules* attach to each other, and remain *virtually dead* in the vessels. The *serum* in which they swam exudes, drains off by *exosmose* (as it is called) or the simple capillary action of inorganic tubes. Hence in cholera, when the blood all retreats from the surface and retires to the interior, it thus oozes off spontaneously, constituting the rice-water dejections and vomitings, characteristic of the disease. Hence the patient's unquenchable thirst, which cannot even keep pace with the sieve-like operations of his intestinal mucous membrane.

R.—That so great a variety of secretions should be produced from one fluid, the blood, appears to me very extraordinary; how is it effected?

Dr.—The nature of the secretion is determined by the functions of the part on which it is poured; thus tears and humours for the eyes; wax for the ears; oil for the skin; mucus for the open cavities and passages; serum for the shut sacs; synovial fluid for joints; saliva, gastric juice, pancreatic fluid, and bile for digestion, &c. Some of these are for purely excrementitious purposes, are provisions made to eliminate impurities out of the blood; as the pulmonary and cutaneous exhalations, and the secretions from the kidneys and bowels. The vital solvent fluids of the several stages of digestion, the salivary, gastric, and pancreatic juices are not from the merely aqueous or excrementitious portions of the blood. But this cannot be determined; and is fortunately of no practical import. Of the function of the *liver* and of digestion generally, I have spoken more at large in the section devoted to the discussion of *diet* and *regimen*, &c. How the vital constitution of each specific gland determines its peculiar secretion, we know no more than how cold freezes, and heat thaws. Such is the Creator's *law*, appointment, and will. We can give no other explanation. No other is needed, no other is possible with our small and limited understanding, in the present state of being. He is a wise philosopher who knows where to stop his researches, and where no further to question, but only with thankfulness and humility to wonder and adore!

R.—I believe there is no denying, that all the *secretions*, as well as *nutrition* are immensely improved under the water-cure treatment.

Dr.—Yes, it is self-evident, *any one* can *verify* the *fact*. But I wish to observe, that the patients having nearly all *chronic complaints of long standing*, live too well and abundantly in our establishments, many of them should be dieted more carefully, especially as regards *quantity*. It is a law of the vital economy, that when the *waste* of the body exceeds the *supplies*, and when pressed to make up the deficiency, putting nature as it were to her shifts, that absorption first removes the least vital parts, as fat, cellular tissue, *morbid accumulations* and *structures* of all sorts. Hence the salutary influence of restricted dieting combined with water treatment, when judiciously carried out. *It does not follow that diminished weight argues diminished vitality*, often quite the contrary, for the *reduction of disease* has been the greater. In the *initiatory* treatment of many

chronic diseases in water-cure establishments, were this more attended to, the *cures* would be *more speedy*. When supplies fail, and the adipose and other tissues of the body are absorbed, and circulated for nutritive purposes, the lymphatics assume a sort of assimilating power, in order to vitalize anew or more highly, the decomposed particles.

R.—I have often heard you mentioned as a "*stomach doctor.*"

Dr.—I hope I have given you sufficient evidence that I am not so exclusively.

R.—Perhaps you will favour me with some additional hints or reflections on this interesting subject of stomach complaints, that may just now present themselves.

Dr.—Willingly. It is clear enough to any one who is a close observer of disease, that injury of the stomach, and *abuse* of its functions, often from earliest infancy, by the irritation of improper diet, drinks, and drugs, may be set down as a *starting point* and primal source of a man's physical and too often of his moral maladies. Even by the majority of medical men the influence of a disordered digestive system, in producing a long list of nondescript and otherwise unaccountable ailments, is very inadequately appreciated. An irritated stomach originating an irritated brain produces much more of the miseries of society—much more of the errors, and failings, and crimes of humanity than is suspected. The symptomatic ailments flowing from this source are often treated as distinct and independent diseases. The stomach and bowels, as in nine cases out of ten the fountain of the evil, deserve therefore the first to be rescued from the agencies of disorder, and to be maintained intact and unimpaired. In their integrity lies the greatest chance of salvation for the diseased body. Under the abuse of drug taking, however, morbid causes resident in the stomach and bowels, are often tenfold aggravated and confirmed; because the *already suffering stomach* is further abused by being made the *receptacle* of noxious and irritating medicines. To relieve the morbid sensations thus induced, the *main causes* of the malady are so perseveringly used *again* and *again* for the *antidote*, that *radical* recovery from either the *primary* or *remote* ailments is all but impossible,—a return of healthy physical and moral sensations almost hopeless. This source of "stomach complaints" is the more mischievous because the least suspected. Medical men, however, are now beginning to open their eyes; and *drug diseases*, or diseased states produced by drugs, are not only recognized, but beacons are now held out to guard against the mischief-working employment of those miscalled remedies, and means are pointed out by which they may be counteracted, cured radically, or what is better, prevented altogether. I fervently hope that the result of the alarm sounded, will be an early attention to the proper treatment of these complaints, by which many distressing hours, days, and years, might be avoided.

The fictitious excitement of the body by stimulating diet, drinks, and

drugs, instead of being a source of fancied happiness, is very often only a marring of man's real enjoyment. The fault in the treatment of the stomach often begins at birth. Its powers from the first are unnaturally taxed. Instead of the mother's bland milk, or something equivalent, the fashion used to be to give a dose of physic, a noxious irritant in some shape, given to satisfy what should be the first cravings of a healthy stomach. Stone was almost literally given for bread. It asks for milk and it gets castor oil, spirits and water, or butter and sugar. To protect the delicate coats of the stomach from such unbidden and unwelcome guests, a flood of mucus is poured out. To produce this effect, a great afflux of blood is determined to the irritated tissue, and a great and gratuitous expenditure of nervous power takes place. Between both, the vital powers of the part are unnaturally taxed, and therefore prematurely exhausted. Irritability of body and mind is the consequence. The *brain*, and every nerve proceeding from it, are painfully excited. Not only inflammation of the stomach coats is often excited by repeated doses, but vast volumes of gas are also secreted. Distension, spasms, griping ensues; can the infant be aught but fretful, unquiet, and crying?

The *theory* of vitiated secretions of stomach and bowels has been a profitable one for medical men, and a fertile source of suffering to infants. A grain or two of calomel is given as an alterative, and twice as much of rhubarb or jalap as a purgative. To lay the irritation thus conjured up, magnesia, laudanum, and dill-water, or such like, are given. By these drugs pain is indeed often subdued, *but constipation ensues, the secretions are arrested.* To undo this mischief, the stimulation of medicines is *again* requisite. The *constant repetition* of these stimulants to stomach and bowels exhausts by little and little their vital endowments, and often *lays a foundation* for the chronic derangement that embitters the years of a whole existence.

The malign influence of this incessant irritation of the nerves of the stomach and bowels is often apparent in the whole future life and character of the subject of it. Vitiated blood from a vitiated stomach, with an irritated brain, induce peevishness, restlessness, nervousness, apprehensions, &c. Sometimes in children a similar state is induced, ending in convulsions and water in the head. The diseases of infancy are aggravated, and their "*dregs*" are often perpetuated through a lengthened track of time. Thanks to the traversing of the digestive tube by an endless succession of pills, powders, and potions, the dyspepsia of the child is the prelude to the bad health, indigestions, hypochondriasis, &c., of the adult.

Again, in *adult life*, to the irritation of the food and physic, that of *fretting*, or worry and anxiety, is added. The morbid sensations in other parts of the body radiate towards the brain, drying up the very source of pleasurable feeling and healthy thought. The anxieties of business, the

cares of life, the absorbing passion for wealth, or the gnawing worm of sorrow, fill up the measure of the mischief. The brain now pays back the annoyances it has received, reciprocates the abuses heaped upon it. The attempts to remedy by *internal* medication, you know, often augments the evil.

The results of all these actions and reactions, this undermining and countermining by food and physic, in many cases end in positive and irremedial disease, and in innumerable shapes—as hardening, diminution or enlargement of liver, jaundice, hæmorrhoids or piles, neuralgia, tic douloreux, and spasms—palpitations and disease of the heart—gravel and kidney diseases—asthma and cough—softening and chronic inflammation of the stomach, &c., and indescribable nervous sensations, that produce the *acmé* of human misery.

This is not a fancy sketch, but stern reality, impressed on the memory of the Water Doctor by the frequent recital of patients, who as a *dernier ressort*, try the water-cure, and make him the recipient of their often cruel and melancholy history.

I will omit much that I had to say on the untoward action of particular medicines, and instead, lay before you an extract from a long article favourable to the water-cure, in the *British and Foreign Medical Review*, Oct., 1846, and particularly because it is attributed to Sir John Forbes, Physician to Her Majesty's Household.

R.—I fancy the worthy doctor must have got himself into *hot* water, by meddling with the *cold*-water cure."

Dr.—I believe he got some sharp raps on the knuckles, for his candid review. But what did honest Sir John care, *coûte qui coûte, he must* say and write what his conscience dictates. If ever you are out of sorts in town, let me advise you to call and see him, he will not "delude" you with many questionable *recipes*, but I will answer for it, he will give you *your guinea's worth* of unquestionable good advice—and that may save you many a golden fee, and the taking of many a nauseous, if not useless recipe.

(*Extract.*)

"The water-cure is a *stomachic*, since it invariably increases the appetite.

"It is a *local calefacient* in the wet sheet covered by dry blankets.

"It is a *derivative;* cold friction at one part, by *exciting increased action there, producing corresponding diminution elsewhere; the compress* frequently acting, if not like a blister, at least *like a mustard poultice.*

"*It is a local as well as a general counter-irritant.*

"*It is essentially alterative* in the continual removal of old matter: its renewal is shown in the maintenance of the same weight.

"An important hydropathic principle is, that almost all its *measures are applied to the surface.* One of the most *formidable difficulties* with which the ordinary physician has to contend is, that nearly all his remedies reach the point to which they are directed *through one channel.*

"The only means of relieving certain diseases *is by inundating the stomach* and bowels with foreign and *frequently* to them *pernicious substances.*

"Hydropathy employs a system of most extensive energetic general and local *counter irritation.*

"A fifth physiological feature of hydropathy is the number of coolings. The *generation of caloric has been traced to its right source.* It results from the burning up of waste matter, which by accumulation would become injurious.

"It is singular enough that almost all arguments used *against cold bathing* are the strongest theoretical arguments *in its favour.* Dr. Baynard, a most sarcastic writer, gives us the following anecdote :—

"'Here a demi-brained doctor of more *note* than *nous*, asked, in the amazed agony of his half-understanding, how 'twas possible that an *external application* should affect the bowels, and cure *pain within?* 'Why doctor,' quoth an old woman standing by, 'by the same reason that, being wet-shod or catching cold from without, should give you the gripes and pain within.'

"If a rude exposure of the surface to cold and wet is capable of producing internal disease, there is no *doubt that a close relation exists between these agents and the morbid* conditions of internal parts."

After a long and favourable review of the water-cure, showing its value, he ends, "After what has been said and written in favour of hydropathy, judgment must therefore be entered by default against its opponents, and hydropathy is entitled to the verdict of harmlessness, since cause has never been shown to the contrary."

R.—To return to the water-cure treatment. I perceive from the *extract*, that the able reviewer has got a tolerable idea of your system, *theoretically*. It would appear, that you trust for curative results almost exclusively to operating on the exterior of the body.

Dr.—And so does Dame Nature, whenever she has a chance, and has not been thwarted and maltreated. As regards remedies, as I have told you before, *I reject no remedial adjunct—medicinal or otherwise*, in its fitting time and place, and when the *indication* is *clear* and *satisfactory*. But it is *derivation*, *revulsion*, or *counter irritation*, that plays the most prominent part in our proceedings. The establishment of new points of nervous and vascular excitation on healthy surfaces, operates *a transfer of morbid action* from old-standing diseases of the viscera, as the liver, stomach, or kidneys. In this way disease extends from *within out*. The old *foyers* (or *foci*) are removed or diminished. We have illustrations of this in the phenomena of eruptive diseases, as *small-pox*, *scarlet fever*, *and measles*. There is a balance maintained between the *interior* and *exterior irritation*. If anything aggravates the *internal* or visceral irritation, as stimulant medicines or improper diet, the eruption *pales* and fades. So also *chronic skin diseases* are almost universally evidences of internal disorder, and augment, diminish, or evanish, with the increase or diminution of the internal mischief. If these cutaneous transferences of morbid action vanish by any other means than *the reduction of internal irritation*, we have reason to fear, sooner or later, the supervention of the worst symptoms,—internal *malaise* and sense of sinking, pain, spasm, neuralgia, cough, hæmorrhages, and even apoplexy.

R.—You seem to lay great stress on the reduction of irritation, local and general, and on *normal* support and stimulation.

Dr.—Yes. It is the foremost idea in the mind of the pathologist and physiological practitioner, and makes him so satisfied with his water-cure remedies.

R.—From what you have said, the phenomena of *fever* in the human body appear to me very curious. I wish I could understand them better.

Dr.—They are of the greatest interest, and much misunderstood. You must read attentively the *part* on physiology, and pathology or the nature of disease; you will then soon get some clear ideas, and better understand what you may read on the subject.

The late and lamented Dr. Graves used to say, that he desired no other *epitaph* than the following, viz. "*He fed fever*"—that is, he sustained his patients in fever by as much nourishment as he could safely introduce. A greater and more honourable distinction will be for the hospital physician, who shall say, Let my epitaph be, "*He treated fever with the wet sheet packing and its adjuncts.*" I will endeavour to give you some notions of *the final cause of fever*, in other words, of the *nature*, *action*, and *ends* of fever, and it will not fail to strike you when you again read the water-cure processes, that they are the common sense, as well as the physiological remedies, for this pathological condition.

Fever is never a primary or independent morbid state or action. It is the result generally of visceral disorder, or interior inflammation or congestion, an excessive or *above par* action of the nervous and vascular systems of the body; but it is always consequent to a state of local depression or *below par* action. The essence of this local morbid action consists in, 1st. The impression of a morbid agent, irritating and thereby impairing, the organic nerves of the tissue; 2nd. Morbid vascular action, inflammation, or congestion; 3rd. Arrest of the function of the organ in part—defective vital changes, and consequently retained chemical elements; 4th. Roused sympathies in near or remote parts; and hence, 5th, and lastly, Perverted sensibility of the organic nerves, and abnormal sensations of the animal nerves. This state of matters is the local essence of the general state called *fever*. It lasts, or is burning, a certain time—a few hours or a few days.

The first lesion in fever is the impairment of the function of digestion, chiefly because it is either first directly implicated, or suffers indirectly by sympathy with the brain or other organs. Under the first assault of disease, whether it proceed from a disorganizing accident, or a small patch of inflammation, under such shock or morbid impression, the first want of the economy is not *food*, but the counteraction of the morbid impression. In fever all desire for food, and in a great measure the ability to dispose of it, is wanting. In the state of fever, great heat is extricated, and great

waste of the corporeal fabrics thereby effected, and a great drain of the fluids. The primary requirement is then for *water*. *Thirst* is set up to demand these supplies. Febrile movement or febrile reaction is nature's mode of counteracting interior congestions and morbid impressions and action, by throwing the load on the surface. For the effect of all interior morbid action is first, to centralize the circulating fluids, to recall them from the *circumference* of the body to the *centre*, and thus to induce undue accumulations in the grand viscera of life. *Ubi irritatio ibi affluxus*, is a sound pathological principle. The fact of a central vital part being the seat of a morbid excitation, determines thither a flux of fluids to the part where the struggle with the unfriendly agency is going on. The result of this state of matters is to rob the exterior parts of their due share of blood. This is indicated in the first instance by *chill shivers* (rigors), sometimes headache. This is characteristic of the outset of all diseases that are sudden in their attack, and of such as are permanently *acute*, as it were carrying on a secret destructive process (as psoas abscess, phthisis, scrofulous ulceration of the joints, &c). Febrile movement or reaction then, are the inordinate excitement of the heart, blood-vessels, and nerves, as an effect of self-protection on the part of the economy, to counteract the tendency of the blood to accumulate in the vital central structures, by *determining to the surface* and *extremities:* to keep the vital fluids in action when they otherwise would stop; in other words, by *operating a revulsion* from the *interior* to the *exterior*. The circulation is then carried on by means of the innate *irritability*, or original muscular and nervous endowments of the circulating powers. The rapidity of the exhaustion of this, is in proportion to the rapid ebbing of life. Hence the rapidity of the circulation increases with the approach of death. This exalted nervousness and vascular excitation is the best condition for reinducing secretions and rapid chemico-vital changes, and so evolving retained morbid elements, and restoring the lost equilibrium. In this view of the matter it may be asked, then, why does fever so often overdo its work? I reply, because of man's unnatural, artificial, anti-physiological habits and modes of life. He often counteracts the salutary efforts of fever in his behalf by close apartments, too warm coverings, and the use of internal irritants. If in his febrile state he had pure air and perfect rest, was frequently *refreshed*, and above par action normally restrained by the different water-cure modes of applying water, and took it also in proper quantities internally, giving his stomach little work to do, from food or physic, till the febrile movement had done its work, then he would generally be cured, unless indeed he had grossly violated nature's laws in other respects, and so left himself no chance, and given nature no scope to save. This will be the case with the healthy receiving morbid impressions, or subjected to morbid agency, the *sickly*,—the *weakly constituted*, the *diseased*, will often sink. Hence the chief victims of epidemics are the

constitutionally weak from any cause; the *drugged*, the *stimulated*, the *exhausted*, the *dissipated*, the *destitute*, the *careworn*. They cannot have a *crisis*, or have it imperfectly, because the vital energies necessary thereto are wanting.

R.—I am now beginning to understand more clearly, and have no doubt that the water-cure treatment, at least of *fever*, will sooner or later have a fair trial in competent hands.

Dr.—I am equally sure, that such an event taking place in any large hospital, would lead to its general adoption. But I perceive you have only a slight perception of the many difficulties in the way. The fact is, *medicine*, as a system of healing, presents a strange anomaly in the history of science. It has not advanced *pari passu* with the march of other sciences, arts, and institutions. The effeminate manners and enfeebled constitutions produced by the progress of society and so called civilization, seem to be the hindrance. The luxury and indolence of refinement naturally seek their gratification in that which most pleases the senses, and that *seems* to save time, or spares labour. Hence the reluctance to systems which at first appear to require some self-denial, to simple habits, to active observances, and natural institutions *that best conduce to regain or maintain health*. Hence also the eager acceptation of any alluring or illusory medicinal system, that exacts the least apparent sacrifices, that is most tolerant to man's bad habits, love of ease and indulgence, and that appeals to his *love of the marvellous*. To this source, no doubt, may, in some measure, be traced, *the prejudice against water-medication*, which, although rebuked by striking facts, and by the greatest authorities, in every age of the world, and every stage of the profession, has yet grown with the growth of man, and the multiplication of doctors.

R.—Is it not lamentable that in these days of progress, a profession like yours, calling itself liberal, should still, after *all* that has been said and done, ignore the existence of the water-cure—that is, if we except the miserable attempts, here and there, at abuse, which cannot be taken as a fair acknowledgment. In your account of Harvey, I see it was just the same thing when the circulation of the blood was discovered.

Dr.—The vagaries of prejudice and credulity—leaving the seductive promptings of interest out of the question—would be highly amusing, as they are interesting to investigate, were it not for the pernicious influence they exert in retarding the progress of true civilization, and the material happiness of our race. The following passages, from an article in the "Scottish Review," I have just read, do not apply amiss to the progress of the water-cure in this country, and will remind you of the manner in which many of our most valuable discoveries have been received :—

(*Extract.*)

"The establishment of the Royal Society was opposed because it was asserted that

'experimental philosophy was subversive of the Christian faith,' and the readers of Disraeli will remember the telescope and microscope were stigmatised as 'atheistical inventions which *perverted* our organ of sight, and made everything appear in a false light.' What ridicule and incredulity, what persevering opposition greeted Jenner when he commenced the practice of vaccination! So late as 1806 the Anti-Vaccination Society denounced the discovery as 'the cruel despotic tyranny of forcing cow-pox misery on the innocent babes of the poor—a gross violation of religion, morality, law, and humanity.' Learned men gravely printed statements that vaccinated children became 'ox-faced,' that abscesses broke out to 'indicate sprouting horns,' that the 'countenance was gradually 'transmuted into the visage of a cow, the voice into the bellowing of bulls,'*—that the character underwent 'strange mutations from quadripedan sympathy.' The influence of religion was called in to strengthen the prejudices of professional and popular ignorance, and the operation was denounced from the pulpit as 'diabolical,' as a 'tempting of God's providence, and therefore a heinous crime,' as 'an invention of Satan,' a 'daring and profane violation of our holy religion,' a 'wresting out of the hands of the Almighty the divine dispensation of Providence, and its abettors were charged with sorcery and atheism.†

"When fanners were first introduced to assist in winnowing corn from the chaff by means of artificial currents of air, it was argued that '*Winds were raised by God alone, and it was irreligious in man to attempt to raise wind for himself and by efforts of his own.*' Few of the readers of 'Old Mortality' will forget honest Mause Headrigg's indignation when it was proposed that her 'son Cuddie should work in the barn *wi' a new-fangled machine for dighting the corn frae the chaff*, thus impiously thwarting the will of Divine Providence, *by raising wind for your leddyship's ain particular use by human art*, instead of soliciting it by prayer, or waiting patiently for whatever dispensation of wind Providence was pleased to send upon the sheeling hill.' A route has just been successfully opened by Panama between the Atlantic and Pacific. In 1588 a priest named Acosta wrote respecting a proposal then made for this very undertaking, that it was his opinion that 'human power should not be allowed to cut through the strong and impenetrable bounds which God has put between the two oceans, of mountains and iron rocks, which can stand the fury of the raging seas. And, if it were possible, it would appear to me very just, that we should fear the vengeance of Heaven, for attempting to improve that which the Creator in his almighty will and providence has ordained from the creation of the world.'"

A very little consideration, however, might serve to convince these people that the idea of a *man* diverting the decrees of the CREATOR—of opposing his efforts to the designs of Omnipotence—of thwarting the will and purpose of Almighty Providence by *human* measures, is the very height of nonsense and presumption.

R.—Patience, *mit geduld bildet mann mauern*. From all I have read and heard, and much that you have thought it better to omit, I perceive that a long and useful chapter has yet to be written on the dangers and difficulties of drug medication.

DR.—Yes, a dark and dreary chapter. By this time, with such perceptions, you cannot fail to be impressed with the great importance of the advantages we possess in being able to *repeat* with prudence, our water-

* Moore's History of Vaccination, p. 46. Blair's Vaccine Contest, p. 69.

† See Barrow's Life of Jenner.

cure remedies for a lengthened period, without any prejudicial effects to the constitution; on the contrary, the constitution, after these remedies, shows unmistakable evidences of improvement, even when any local malady has failed to give way.

R.—But I hear that you use all kinds of medicines yourself, and have been even known to apply leeches since you have practised the water-cure.

Dr.—Certainly, and with the most satisfactory results; but such occurrences are very rare. There are few indications for the use of any medicines under water-cure treatment. Many of the many medical men who have lived with me here, most of them under treatment themselves, have expressed their surprise how seldom they could point out to me in their own, or in any of the numerous cases under their observation, a fair opening for the beneficial use of any drug. For instance, they could adduce no sufficient motive for the use of any purgatives, finding that, in the majority of cases, the water-cure treatment soon restores the free and natural action of the bowels; they could find no indication for tonics, or provocatives to eating, for the water-cure appetite generally requires restraint. When the water patients are found to sleep seven or eight hours without waking, no excuse could be made for administering any opiates. Nor are diuretics needed, when pure water can be freely taken—thus I might go on through a long enumeration.

If the water-cure was not what it is represented to be by its best advocates, if there was a question of its *safety* and *efficacy*, it would be natural to imagine, that its practitioners would not be so willing to bring their patients together—many of them in the most delicate condition, and suffering under grave maladies—where, morning, noon, and night, they can compare notes.

I may also mention here, how pleased I am to receive medical men, either as patients or visitors,—or non-professional visitors, who are desirous of judging for themselves of the general results and working of this system of treatment.

R.—I suppose you met with great opposition when you first commenced the practice of the water-cure?

Dr.—At first it was more banter and derision than abuse. But soon there appeared in some of the papers exaggerated accounts of my success, then the matter was considered more serious, as shown by some abusive articles in several medical journals. To some of these I published an angry and bitter reply—since then have had a quiet life.

I was the first English (medical) man who went to Græfenberg, and I have every reason to believe, judging from all I have since experienced, that if I had not gone there, the water-cure would hardly yet have excited attention, or made any progress in this country. When I had been there several months, Captain Claridge arrived, induced to follow me, by my

letters, and his wife's persuasion, as she told me. His popular work on the water-cure was the first that appeared in this country—and my success in practice here, soon after, induced many medical men to visit Græfenberg, and also to adopt the practice. On my return to England, the water-cure met with no encouragement from any of my medical friends or acquaintances, with the exception of one, who soon after adopted the water-cure, and has since aided in the prosperity of Malvern.

When in Italy, my friend, the late lamented Captain Grover, advised me to visit Malvern before I settled anywhere; this I did, and found it a deserted village, but possessing all the requisites for a Water-Cure Sanatorium. The climate mild, yet bracing, the purest water, with green hills already intersected by walks for invalids. My landlord, I discovered, was a bankrupt; he told me—although we were in the month of June, of one of our finest summers—that I was the only person in the hotel, and the only stranger in Malvern. I took his house from the assignees, being the most suitable I could find for my purpose, but soon, however, found the necessity for a larger house, and determined on building one with all the requisites for patients under water-cure treatment.

R.—I heard that a company had built it for you.

Dr.—Very likely, but it was not so. I was my own paymaster, and it cost altogether nearly twenty thousand pounds, every guinea of which I received from patients at Malvern. My private income was not touched. It soon paid for itself, and will again and again, if I do not retire early from the cares of office. Many were opposed to my undertaking, but when my establishment was finished, and full of patients, the effect it produced on Malvern was much what might have been anticipated—house building began, and went on rapidly. There is now a new town of commodious villas and lodgings; it is now well-drained and supplied with water, gas is in preparation, and there will shortly be a railroad to Worcester, eight miles distant, which will make the transit to London little more than three hours.

R.—In short, you consider the water-cure and its establishments as one of the settled institutions of our great, free, and enlightened country, and a real blessing to the invalid portion of the community.

Dr.—You have stated a great fact, which as time advances will become more acknowledged, and better known.

PART FIRST.

INTRODUCTORY.

CONVERSATION FIRST.

Professional subjects worthy of the attention of unprofessional people—Into what new channels education should be directed—Physical studies not dangerous to religion or morals—Philosophy and revelation not antagonistic—Duty of acquiring a knowledge of the human constitution and its relations with external nature—Sources of disease not occult and mysterious, but palpable and open—Means of prevention within reach of all—Special reasons why the laity should study physiology, pathology, dietetics, curative systems and principles, &c.—The physician should be the teacher as well as the healer—A "system of preventive medicine" needed—Precepts of the art of healing to be deduced from the principles of physiology—The water cure a system in entire conformity with those precepts—Society to be ameliorated by the co-operation of human with divine agencies—Instrumentality of secondary causes—The physical, mental, and moral culture of man to be based on physiology—The mind acts in accordance with organic laws—Cautions to students and teachers—Temper a physical quality or condition—Laws of action of the various corporeal functions tantamount to direct dictates of divine Wisdom as guides of conduct—The teachings of the various branches of medical science deepen our conviction of a divine superintending Providence, and afford a motive of reconcilement to his arrangements.

PATIENT.—IT is to be deplored that the public in general,—even the higher classes, and the best educated classes,—take too little interest in the studies that of all others should be the most full of

interest to them;—viz., *the structure and functions of their own bodies—the laws of health—the nature and causes of disease—and the means of its prevention and cure.* I confess it has been only after having lost my health—and having seen on every hand my friends lose their health and lose their children—through the ignorant violation of these laws, that I have begun, chiefly at your instigation, to study subjects which I always deemed exclusively *professional*, fatiguing, and in some respects repulsive,—but which I now find to be intimately *personal*, highly interesting, and, with a little patience, even fascinating.

Doctor.—Believe me, sir, *the knowledge of ourselves*—in this wide and scientific sense—is one of the most important of human acquisitions, and the pursuit of it one of the noblest exercises of the mental faculties. Education should be—and will be—more directed into this channel than heretofore. The "*Literæ Humaniores*"—grammar, language, arts, &c.—are all excellent in their places—indispensable attainments for the well-bred man; but they occupy too exclusively the time and the efforts of scholastic training. The studies connected with the operations of Nature—in other words, the Natural Sciences—surely deserve a commensurate share of attention.

P.—But there is a prejudice current that these studies are naturally inimical to religion!

Dr.—There may be an "under-current" of that sort, but not to the extent you imagine; and it is now mainly confined to the illiterate vulgar or incurably bigoted. But so far as it goes, I lament the existence of such a prejudice, because it is without any colour of reason, or foundation in fact. Never was so great a mistake, as the idea that there is any danger to true religion or morals, from the prosecution of physical inquiries. The dominion of error is at all times pernicious: here it is doubly baleful; because it extinguishes to us invaluable practical lights, and mystifies, perverts, and paralyses our faculties.

There is *not*—there *cannot* be, I boldly assert—even the shadow of conflict, antipathy, or antagonism, between Nature and Revelation, between the Work and the Word of the Almighty. On the contrary, they mutually corroborate each other, throw light on each other, and should go hand in hand in perusal. Next to the latter, the former yields the truest happiness, and the most general enlargement of mind. The precepts of the one are confirmed by the inductions of the other. That line of conduct which religion

enforces by its simple authority, philosophy shows to be the most expedient and fitting for man in the nature of things. Both teach the ascendancy of the higher powers, and the subjugation of the lower; both show that the world, and the things therein, are created in accordance with this principle, and yield happiness, and afford success, just in proportion as we act up to it. Both point out the proper objects of human existence. Both coincide in inculcating this grand fact, *that obedience to law, whether moral or material, natural or revealed law, is equally our duty and our interest. It leads to health of body and mind, to purity and peace. Disobedience, on the contrary, leads to sin and sorrow, to disease and unhappiness.* Of course there are points in revelation which are above reason. It is the very nature of a revelation that there should be such. There are spiritual existences, influences, and verities, which are not capable of mathematical demonstration, but which are apprehended by faith, or only realized in the inward consciousness or *soul* of every man who submits himself to divine teaching. The man who heartily receives the truths of Christianity will be convinced of its high origin and authority by a change in his views, in his feelings, in his aims, and in his entire nature, such as no system of human reason, and no influence less than divine, could effect: and all this independently of its historical evidence, its pure morality, its benevolent precepts, its ennobling sentiments, its soothing in sorrow, and its comfort in calamity.

P.—I believe the excuse of mankind for the neglect of studies that so intimately bear on their best interests, is the belief I hold in common with others, that this sort of knowledge is exclusively professional, and therefore only fitting and useful for those who are to practise physic or surgery.

Dr.—That is a pernicious error. What man of sense does not apply to himself, and adopt as his motto, the fine sentiment of Terence?—

"Nihil humani à me alienum puto."

I hope to live to see the error in question as extensively corrected as it deserves to be; and also humbly to labour for that end. I rejoice that this correction has begun. The axe has been laid to the root of a tree laden with bitter fruit to mankind; and the needful reforms will advance, in proportion as men come to be thoroughly alive to the vast mass of gratuitous misery and ill-health they endure, and *entail*, through ignorance of themselves.

P.—You subscribe, then, to Pope's axiom, but give it a larger sense than the poet intended?—

"The proper study of mankind is man."

Dr.—I do. The time, I trust, is at hand when it will be regarded *as among the first of human duties to acquire a knowledge of the human constitution, and the constitution of external nature as related to it.* On this external nature—the organic and the inorganic world around us—the living organism is all in all dependent; for thence it derives the *stimuli* and sustainers of its vitality. All our organs are carefully and curiously adapted to the constitution of the things in the midst of which we live, and move, and have our being. For example: animal structure is peculiarly fitted to that which is required of it: the senses are adapted to the objects on which they are designed to be exercised; the stomach to food, and various sorts of food to various sorts of stomachs; the lungs to air, &c.; hoofs and claws, hands and feet, to the respective purposes they have to fulfil.

It is because of not understanding, and not observing, the laws of this relationship, that we bring diseases upon ourselves; or mar recovery when they fall upon us unavoidably, through accidents, vicissitudes of weather, &c. For example, many people persevere in eating through the summer the fat, heavy food of winter; the result is to induce biliary and other derangements, which show themselves in autumn, when the temperature is most steadily high. By a common error of causation, these attacks are generally laid to the score of fruit, an excess in which, perhaps, may have been the first thing to unlock, by diarrhœa, the long pent-up accumulations of the liver. In the same way, engravers, astronomers, and microscopists are very apt to strain and disorder the eye in their researches, through not observing the due relations of light to the tissues of the organ of vision.

The sources of disease are only in a very few exceptional cases occult and mysterious. *Ordinarily, they are palpable and open: and the means by which they may be prevented or neutralised are simple, and within reach of every one.*

P.—I have begun to find—from the attention I have recently given to these matters—that Physiology, Pathology, Dietetics, Curative Systems and Principles, are studies intensely and intrinsically interesting, and worthy of cultivation even *for their own sakes.*

DR.—But their great value and utility consist chiefly in *their practical applications*, which is the point of view we shall ever have regard to in these conversations. The knowledge which it is their aim to impart is a desirable attainment for every human being, and this on a great variety of grounds.

Firstly. As expanding the mind, and enlarging its views both of moral and material subjects; while at the same time it lends the strongest confirmation to the intimations of Holy Writ touching the Divine Being, his attributes, works, and ways.

Secondly. As the basis of all *systematic* mental and physical discipline, it is fitted to be a co-worker with Revealed Truth for the moral, mental, and physical improvement of mankind.

Thirdly. For the light it throws on the nature and causes of disease, and for the suggestions it affords us to the best means of its prevention and cure.

Fourthly. By unfolding the operation of HYGIENIC INFLUENCES, it places in our own hands the most rational means of maintaining and invigorating health.

Fifthly. By developing the normal condition of functions, as contrasted with abnormal; and by elucidating the signs of the latter, it serves as a guide to the unprofessional man to recognise the *beginnings* of deviation from health; and therefore makes him more on his guard, and more alert, to check in the off-go the operation of morbid causes—thereby averting danger, and nipping disease in the bud.

Sixthly. By unveiling the "Mystery of Medicine," the fallacy of nostrums and nostrum-mongers, and by expounding the philosophy of a true curative art, it enables the non-professional adept, to form an accurate judgment, as to the conflicting claims and pretensions of medical sects and systems.

Seventhly. It affords him, when a patient, the advantage of more clearly explaining to his medical adviser the origin and course of his malady, the progress and direction of the symptoms, the effects of treatment, diet, regimen, &c.

Eighthly. The last advantage of the study of professional subjects by the non-professional man, is, that in the treatment of disease, it renders him so much the more an intelligent co-operator in the aims and plans of his physician.

P.—I can readily conceive all this, and subscribe to it with all my heart. These are no trivial arguments and considerations to induce us, the laity, to make a diligent study of the

branches of practical science in question. They urge us to this by every motive of self-interest, and every dictate of our duty to others. But let me add one other argument which my experience suggests—and, I believe, it is no unimportant one—viz., how much more weight medical counsels would carry in the mind of a patient so instructed! how much better they would be received! how much better understood!

DR.—On reflection, you will perceive that this, analysed, resolves itself into my last head of remark. It is because of the better appreciation of the aims and views of the practitioner that they are better followed out—his efforts better seconded. Let me here—however, by way of *supplement*—add a consideration, however inimical it may be to the mere "business interests" of the physician. It is this. Medical advice to such well-instructed patients would be superseded in a multitude of cases—would not, in fact, be necessary,—would not be sought. The more people know of the principles of Physiology, and of the true philosophy of *the causation and cure of disease*, the stronger and more fruitful will be their faith in HYGIENIC INFLUENCES: and the more early and constant recourse will they have to their help, on *the ground of precautions against threatened disease.*

P.—It must be admitted, that the professional illumination of unprofessional people, is sufficiently disinterested on the part of the physician. But there is more in it than this; to me you seem to enhance his office, and to enlarge his sphere; you arrogate for him, in the time to come, a higher function than in days past. His is, or ought to be, you imply, not simply and exclusively the HEALER, but the TEACHER, and the teacher not of a coterie or of a class, but a disseminator of knowledge as general and wide as are the evils it grapples with, and the remedies it proposes. Am I right, in so interpreting your enlarged views of the extended sphere of medical functions demanded by the present times—by the urgent wants of society?

DR.—You are. *That* is precisely my meaning; the legitimate carrying out of my doctrine. Upon the Physician it devolves in a pre-eminent manner, according to my estimate of his sphere, to rouse attention, and to remove ignorance, on the grand questions affecting Human Health, Life, and Disease. To what extent medical ancestry may have been remiss in this duty, it will remain for the zeal of their professional posterity to make amends, and to supply their lack of service. All must allow *that to in-*

struct patients how diseases are induced AND THEREFORE HOW PREVENTED, is a matter certainly of equal importance to quelling suffering. This PREVENTIVE MEDICINE—a grand desideratum of society in the present day—has its basis in the sciences I have undertaken to elucidate to you; and the inculcation of its precepts, is one of the grand objects ever held in view in these conversations.

P.—Will not this also suggest, or involve, the best means of curing or mitigating diseases?

DR.—Of course it will, by natural consequence. Physiology, for example, teaches us, by the relation of what laws of the constitution diseases happen. Pathology by comparison with Physiology, *i. e.*, by comparison of the sound with morbid states, teaches us what precise disordered actions of the economy diseases consist in, or superinduce primarily or secondarily. Physiology also, by unfolding the laws of healthy action, instructs us how disordered action is best rectified.

P.—Physiology, by that showing, is then the only true basis of an enlightened science, and effective Art of Healing?

DR.—Yes; without this the practitioner is a mere empiric and routinist. The accomplished practitioner must be an able physiologist. Both have to do with, to act on, and modify, in all sorts of ways, the properties and powers of the living solids and fluids, the organs they constitute, and the functions they subserve. The path which Nature follows in her sanative efforts, the agency she works with, the aids she requires, the laws she conforms to, the rules she acts by, these it is the business of Physiology to reveal; of the physician to study and apply in practice.

P.—The whole tenor of your remarks, then, goes to show that Physiology is a study highly interesting and important to every one, whether professional men or not, who is anxious to fathom the true Philosophy of Healing.

DR.—And *so*, in that point of view, it has been insisted on by the great luminaries of the Profession. Nevertheless it is a study whose practical teachings are too little regarded, or carried out, by the masses of actual practitioners; in fact, they are almost quite laid aside as guides in the treatment of disease. Otherwise the cumbersome machinery of modern Therapeutic Art, could never have come so completely to overlay Physiology as it does—to ignore its precepts—virtually to repudiate its alliance.

P.—Of course this only applies to the masses, the stand-still

men, who practise as they were taught many years ago. It must be different with the leading spirits, the men of progress of the Profession?

DR.—Yes; fortunately, or providentially, the latter see the error of the old course. One of the leading medical journals lately advocated a return to those sane and simple principles of treatment embodied in the physiologic and philosophic WATER-CURE. But this is, perhaps, somewhat anticipating or diverging from our main track at present. This is the point of view of Physiology for the *Profession* to consider. My aim at this moment is to show it in those points of view that most intimately affect the *public*, as individual men interested in it; as, in short, *the business of every man*, and *the concern of every bosom*. Need I say more to urge mankind to take up this subject with the earnest attention it deserves, than simply to state the fact, *that thoroughly to understand the human organism, and the laws of its action is the best guarantee for the observance of the rules of health, and therefore for the possession of the blessing of health.*

P.—It strikes me as also another consequence of your doctrine *that a vast number of diseases mankind fall victims to, could be resisted altogether by our bodies being in the condition they ought to be, by the observance of the corporeal laws.*

DR.—You are quite right; but I go a step further, and enunciate a larger proposition, one which I have only hinted at before, viz., *It is from the study of Physiology, and the general observance of the laws of health so inculcated, that we may expect to see the greatest improvement in the physical, mental, and moral conditions of individuals, families, and communities.*

P.—Now I fancy you are going too far—at least you are speaking unguardedly. This might be misconstrued by some as an attempt to ameliorate human nature and human society by other influences than those which religion points out as alone adequate to that end.

DR.—Such persons would, indeed, mistake and misapprehend me; but I hope to prove to you that my doctrine violates no principle of Divine Revelation, and invokes no agency which *it* does not sanction. In stating my conviction that all *education*, all attempts to improve the condition of man in any wise, must be based upon sound views of his nature and constitution, I only recognise the operation of the Deity's own established laws and order of things; those SECONDARY CAUSES which He has chosen

never to dispense with—save in the case of miracles. *In all ordinary cases Divine Providence fulfils his designs by virtue of a specific agency adapted in each case to the effect to be produced.* The common sense and daily experience of mankind, even the devoutest, lead them to act on this principle in all the conjunctures of their affairs, great and little. I admit, and believe with you, that it is God who "healeth our diseases, and redeemeth our life from destruction." But does this belief tie up your hands? Does this doctrine indispose you to have recourse to human aids and human precautions? You are ill, and you send for your physician with all speed; he inquires into the conditions that have superinduced your illness. He finds an open drain issuing a poisonous miasma; you have it forthwith shut up, and get well thereon. You have, perhaps, been eating and drinking intemperately; the necessity of moderation in food, and total abstinence from strong drinks are insisted on, and you find your account in the better practice; or you have been exercising unduly, or neglecting exercise; courting impure air, heated rooms, and too long sleep; or you have been exciting your brain by acrimonious controversy, exhausting studies, or gambling speculations; or you have been indulging your passions to excess. In any, or all of these ways, you may have been transgressing the laws of health. Your physician opens your eyes to seeing your deviation from the right organic path, the physical causes of your physical derangement. You stop short, and alter your course, reforming the things that remain to be reformed. You act out physically, if not morally, the great gospel-principle of *ceasing to do evil, and learning to do well.* Your reward soon follows in the glad rhythm of returning health. You thank God, your deliverer, who has "crowned you with his mercy," and "made all your bed in your sickness," and you act right therein. But, observe, *in all this He has worked by his own appointed agency*, the SECONDARY CAUSES, whose instrumentality you *prudently* had recourse to.

P.—Your logic carries with it the full assent of my understanding. All you contend for, then, is *adequate means to adequate ends?*

DR.—Just so. In the same way, do we practical physiologists, in projecting schemes for the improvement of man—physical, moral, and intellectual—*build upon God's own laws and conditions of things*, recognising and using the agency of his own appointment. Shall we be blamed for that philosophy, or rather

that common-sense experience, which teaches us that men do not gather grapes of thorns, or figs of thistles. Men may be liars, and nations believe in lies, but God's laws are as undeviating and everlasting as his truth.

P.—Well, so far I am satisfied. But a difficulty at this point presents itself. I can readily conceive your doctrine *of the necessity of resting all education on the basis of physiology*, true of man in his *physical* capacity. But I do not see so clearly its applicability to the moral and intellectual culture of man?

Dr.—How much it applies here, a little explanation will enable you fully to perceive. It has pleased the Creator, in man's present state of being, inseparably to associate mind with matter —body with soul—so that all the changes of the one intimately influence the other. The manifestations of intellect are entirely in proportion to the *development, intrinsic quality, and healthy action* of its appointed instrument, the brain. The imperfectly evolved brain of the new-born infant, only suffices to minister to the necessary instincts of its existence; and it is at first bewildered by the intimations of its own senses. But as growth proceeds, and the cerebral structure developes itself, then the powers of the mind shine forth correspondingly, and grow brighter and brighter with advancing youth, till they attain the meridian splendour of the mature man. On the other hand, the brain, in common with every other organ, feels and shows the ravages of all devouring time. With the progress of age, the intellectual powers gradually obscure, till at length, in extreme decrepitude and feebleness, they extinguish altogether. In diseases implicating the structure of the brain, mental manifestation is dimmed or destroyed, or some faculties may be morbidly exalted and others depressed, according to the varying phases of the malady, or the special organs affected. In the same way, the mind, through the brain, is at first roused by stimulants or narcotics, and then overwhelmed or stupified.

P.—The condition, then, of the brain, it clearly follows, is the measure of the working power of the intellect.

Dr.—In other words, *the mind acts wholly in accordance with physiological laws.* If we are therefore *duly* to cultivate the mind, its exercise must be regulated by a strict regard to those laws. But how little is this thought of, or attended to? At schools and colleges, for example, it seemed, at one time, to have been taken for granted, that the mind had no dependence on the

body. I believe the evil has now considerably abated, thanks to the spread of physiological knowledge. Setting aside the violation of the organic laws by the "fast" men, these laws are equally violated in another direction, by crowds of the most steady and gifted youths, in the mad haste to come forth early prodigies of learning. But study thus pursued defeats its ends. Such men are sure to fail of the great destinies their opening talents promise. We need not quote cases. The annals of literature are full of them, and you find them in crowds at watering-places, and health resorts.

P.—By this showing you make it very manifest of how great importance an acquaintance with physiology is to all teachers and guardians of youth.

Dr.—Even a moderate acquaintance, on their parts, with physiology, and its associate branches of science, would prevent many of the casualties by which some of the brightest intellects have been prematurely eclipsed by disease, or quenched in death.

P.—It seems, then, that effectively to train the intellect, we must in the first place address ourselves to the organisation, as the regulator of the *measure* of its exercise, at least.

Dr.—Yes, in our educational efforts, we must keep within the limits of the organic laws. Those to be observed, refer not merely or alone to the brain and nervous system (the instruments of the mind), but to all the co-related functions of the body. For example: a corresponding regard must be paid to ensure the conditions of the healthy action of the muscular, respiratory, and digestive apparatus; because these are the indispensable agents of the elaboration of the new materials, supplied to recruit the large draughts of energy, continually made upon the brain and nervous system. As regards the cerebral organs themselves, their exercise must be alternated, one set called into play after another. The mind, or action of its faculties, wearies by long study, because the material organs subservient thereto are exhausted by over exercise; in the same way as sets of muscles are fatigued by excess in their exercise—as in walking, dancing, riding, skaiting, &c. But we can rest the mind by merely a change of study—*i.e.*, by calling into play a new set of mental faculties, and thereby a new series of cerebral organs—leaving in inaction those which have been overworked. On the same principle, *to a certain extent*, the agriculturist rests his fields by rotation of crops. On the same principle, a man weary of sawing, or drilling, or dig-

ging, or reaping, may find an agreeable change in an alternation of equally hard labour that exercises a different set of muscles.

P.—All this has now made very clear to me how physiology applies to the intellectual culture of man. It equally applies, I take for granted, to the culture of the moral powers.

Dr.—This needs no demonstration. The fact is too palpable to require a moment's insisting on. If my child, in ordinary health good tempered, becomes irritable, passionate, and peevish, I do not forthwith proceed to beat the "naughty man" out of him; *but I seek to rectify those corporeal derangements, of which such fretfulness, is the sure sign and symptom.* What temper, I should like to know, is amiable and mild, under a fit of dyspepsia? Under the jarring elements of undigested morsels and morbid secretions, acid and wind, bile and phlegm, raging in the stomach, and by the sympathetic irritation, lashing the brain almost to madness?

P.—Enough! You have clearly proved your point, and dissipated all doubts and objections as to the expediency of bringing in physiology as a co-worker in the great cause of human progress.

Dr.—Believe me, my dear sir, the objectors against the alliance of philosophy and true religion, object from *prejudice.* They entirely misapprehend the real grounds of the question. I, as sincerely as they, have been taught to found all my hopes of happiness in this life and for the life to come, on the great truths taught in the Gospel. But, at the same time, I must be allowed to utter my profound conviction, that the dictates of the natural laws we have so often referred to, are in strict accordance with the teachings of the Divine Word. For what, after all, are those laws of nature but simple *mental abstractions,* terms framed to mark our sense of the course and order of the operations of Almighty power? Nature and revelation are the emanations of the same Supreme Mind. They bespeak the same glorious attributes of Deity—the one exhibiting them in the government of the material universe, the other in the administration of the moral world. Of the divine works, our studies limit us to one department, that of human life and organisation. This is a world of research in itself. The laws of action of the various corporeal functions once ascertained, *are equivalent to a declaration of the will and intents of the Creator, as set forth in organism.* They may therefore be regarded, as the direct dictates of Divine wisdom,

for our guidance in the matters relating to the body, and are *pro tanto* a REVELATION, coming with all its sanctions, invested with all its authority, meting out its appropriate measure of blessing on obedience, of punishment on disobedience.

Let me conclude this our first conversation, by reiterating my advice to study physiology, and its allied branches of medical science, and this, by every consideration of the value you attach to life, and of the duty you owe to your family, if not to society. The subjects themselves are fraught with the highest delight; at once exalting the thoughts and soothing the heart. Independently of their invaluable practical applications, they are intensely interesting for the abstract and speculative truths they unfold. Above all, they inspire the most profound convictions of a divine superintending providence; and by increasing our faith in the wisdom and beneficence of his arrangements, they afford abundant motives of reconcilement, to all the *unavoidable* ills of mortal lot.

CONVERSATION SECOND.

It is the interest and duty of every one to study the subjects of organisation, health, disease, remedies, regimen, diet, air, and exercise—The baneful consequences of ignorance thereon—Prevention better than cure—The investigation of popular medical questions not a meddlesome interference with the vocation of medical men—Whence faith in nostrums?—Whence the patronage of quackery?—The divine protection vouchsafed through the instrumentality of secondary causes—Objections answered—That it is possible to exaggerate the value of rules of regimen, &c.—Agencies of slow and imperceptible operation often most ruinous to the constitution.

PATIENT.—IN your first conversation you have rooted out of me some prejudices and corrected some grand mistakes. In common with others—the unknowing—I had always deemed that the professional subjects we have now entered on were *exclusively professional*, and were at best foreign, dry, technical, and repulsive. Now, I find that their discussion is calculated to *come home* to

every man—to rivet his earnest attention—to excite his liveliest interest. It is quite clear that the great practical questions of human life, viz., ORGANISATION, HEALTH, DISEASE, REMEDIES, REGIMEN, DIET, AIR, and EXERCISE, must become a more popular and systematic study than heretofore—on the plain ground that *what is every man's* BUSINESS *or* INTEREST *to know, it is every man's* DUTY *to know.* Here correct information, as it would bestow an additional security to life, would also lend it a new charm.

DOCTOR.—Truly said. A grand source of poignant sorrows to the human race, lies in the ignorance and indifference of society, regarding this most vital of all *human* knowledge. I contend that the sciences in question must become as familiar in the minds of the masses, as household worlds are in their mouths; and I trust, and I believe, that they will ere long constitute a prominent part of the scientific education of youth. To the failure of such a system of tuition, and the neglect of the physical, mental, and moral *training* it involves, what sacrifice of promising youth do we not owe? what destroyed health? what blighted hopes? *what incapacitation for the active duties of life?*—all this, and just at the period, when the youth, now the premature man, should be otherwise prepared to launch out into the great world, and reap the harvest of the life-long pains and prayers of his relatives.

P.—Yes. If this be the bitter fruit, as there seems little doubt, of the neglect of physiological instruction, and its attendant training, what parent should not be more anxious to impart them to his children, than to load them with wealth, or to cram them with accomplishments?

In view alone of these sad contingencies, which so often bring down the grey heirs of parents with sorrow to the grave, I shall no longer have the hardihood to assert that physiological and other studies, reputed purely professional, are not worthy of the zealous pursuit of every unprofessional person. I, for one, as the father of a family, attach to them *now* a double importance; on the one hand, as anxious to secure to them (as far as in me lies) sound constitutions and the conditions of lasting health; and on the other hand, as having a very natural concern to improve my own constitution and to prolong my days, for their sakes.

DR.—Heads of families, such as you, will, I predict, more and more study the ART and the SCIENCE of PRESERVING HEALTH; and without waiting for the actual inroads, or appearances of disease, will come more and more to consult physicians, *as to the best*

modes of invigorating delicate constitutions, of obviating morbid tendencies, and of correcting hereditary taints!

P.—It is but seldom, however, that people will apply to physicians on the point of the *prevention of disease.*

Dr.—Physicians, therefore, must go to them, and force their advice upon them; that is, if they will not be prompted to study these subjects from spontaneous conviction.

P.—Well, I am sure society in the long run will thank physicians for thus virtually acting out Dr. Chalmers's "aggressive principle" in its behalf, and for catering to wants *it is its misfortune* not to feel adequately; but which are not the less real and urgent. If the attainment of physiological knowledge is by this showing a bounden duty of all parents, it strikes me as being especially so of all *mothers*, on whom *entirely* the care of infants and children, and, *for the most part*, that of sick persons, devolves. I cannot conceive anything more obstructive of the efforts of the physician, in the cure of disease, than their ignorance, especially in critical cases.

Dr.—True: and I hope to see the day when all well-educated mothers will come to look at this subject in the light it deserves, and will *redeem time*, to devote it to studies that will repay their pains with so large an interest—the improvement of their own health and that of their little ones. Again, for physical and mental discipline (which mothers have so long the management of) to be *systematic* and *effective* requires a sound knowledge of the physical and mental constitution of the child. Yet how few mothers pretend to this? And what is done, what provision is made in the education of women, to indoctrinate them suitably to their functions and destinies—to imbue them with this fitting, indeed indispensable knowledge?

P.—The question of the propriety of mothers cultivating popular Medical Science is *settled* in my mind, at least, by the consideration of the extent and nature of *maternal influence.* Is it not from this that our minds, as well as our bodies, receive their best or worst direction?

Dr.—I quite subscribe to your doctrine of the momentous moral, mental, and physical results of woman's influence on her offspring—that our health, knowledge, virtue, happiness, are greatly determined by the sort of mammas we have had. Yet, I ask again, what means does society set apart to educate women, to wield their influence exclusively for blessing, and not for bane?

P.—What means? I pause for a reply.

Dr.—Nevertheless the effort is begun in the right direction. Many mothers of families, to my knowledge, are enthusiastic students of Physiology; and I believe they will every year increase.

P.—But I have heard it objected as an indelicacy in women to study these subjects. I don't think there is much in that. But what do you make of it?

Dr.—The supposed indelicacy is a fiction. The notion is degrading. Physiological studies contract, enervate, or sully the mind? *Impossible!* On the contrary, no other human knowledge is so calculated to expand, to strengthen, and to purify both the heart and the head, the affections and the intellect. Such is my conscientious opinion. What mothers of future generations shall we have, what early trainers and teachers, what nurses, when women will be prepared for the discharge of their duties, by the inculcation of the knowledge, and the formation of the habits, we contend for! Would a physiologically-instructed mother send her feeble boy to school ere he was hardly recovered from a severe illness, to receive him back in six months *palsied* in the lower extremities? Would a physiologically-instructed mother teach her child not to be a juvenile glutton only, but a glutton for life, by pampering him with all manner of delicacies, or allowing him habitually to gorge himself even with plain food? Would she develope a premature taste for strong drinks by indulging him often with a glass of wine after dinner? Would she allow him to sleep in an unventilated bed-room, under smothering loads of bed-clothes, even in mild weather, and with curtains close drawn around his bed, lest her tender plant should take a "breath of air," and so be blighted?

P.—All which, and sundry worse things, I myself have known mothers to be guilty of. But to proceed. How do you dispose of the objection, made by some of the faculty against non-professional men studying the structure and functions of their bodies, and the questions of theory and practice growing out of such study —the objection, namely, that it is a meddlesome interference with their vocation?

Dr.—There is no force in the objection whatever. At best, it is only the offspring of bigotry and prejudice. Few enlightened physicians of the present day would choose to have ignorant patients, if they could have instructed ones; or would not find their account in indoctrinating them with sound views of vital medical

questions, if they could do so easily. How much more satisfactory to the patient, how much more agreeable to the physician, is it to follow out a plan of treatment, the scientific basis of which is thoroughly explained and appreciated? In the treatment of chronic diseases, especially, patients cannot be too well informed about their cases. In proportion as a patient is made to understand the true nature of his malady, and the curative rationale of the proposed measures, in that proportion will his own confidence be increased, and will the more effectually (because cheerfully and intelligibly) second the efforts made for his benefit. The more the healing art advances, the more its measures will be prescribed with the consent of the patient's understanding. Authoritative dictation may succeed with many whose fears are excited, or whose faith is implicit; but it is always best to appeal to the higher powers of the man, to carry with us the sanction of his reason.

P.—There is yet another objection I have heard urged to the study of Physiology, diseases and their modes of cure, &c., by unprofessional persons, viz., that it is not only unprofitable but pernicious—that it will make invalids of the healthy, and aggravate the ill-health of invalids; that, at the best, it will only make people think of themselves and their corporeal sensations; that, in short, it will make them hypochondriacal and unhappy, selfish and self-absorbed!

Dr.—We dissent entirely from the doctrine that intelligent inquiring minds should not make themselves acquainted with the phenomena of the body, not only in the sound, but also in the morbid state. I assure you, in the great matters of health and disease, ignorance is anything but bliss; it depresses, enfeebles, degrades, misdirects. It is the parent of blind credulity, the fertile source of implicit faith in specifics, in nostrums and in nostrum-mongers, and the grand patron of quakery, and all this, because it cannot discriminate sound science, from delusive pretensions and impudent impostures. The ignorant patient is full of fitful fancies, and is the sport of frequent, vague, unnecessary alarms: danger appears where there is no danger, and every trivial occurrence unhinges him. Is it any wonder, then, that, excited by his fears, and anxious for his safety, he falls into the snares of charlatans, and becomes their willing dupe and victim! On the contrary, no man is so happy, so likely to retain health, or to regain it when lost, as he who has best informed himself, of what should be every man's

first earnest study—his own organism, and the material agencies that operate upon it from without. Best knowing the path of disease, he knows best how to steer clear of it. When any accident upsets the balance of health, he is best armed with fortitude and self-possession; he knows best what precaution to use, what aid to have recourse to. KNOWLEDGE is to him POWER truly. It saves life, it saves health, it saves time, it saves anxiety.

P.—But in all this you seem to me to overlook one thing, viz., when the sense of danger prompts the desire of safety, is not our best security found in the Divine protection invoked?

DR.—Of course it is. But is this accorded irrespective of conformity to the Divine appointment? You forget your admission that, unless in the case of miracles, the Almighty works *through the instrumentality of secondary causes.* You must use the means of security. Is it not the result of this agency, the appointed and necessary sequence of things, that attention to, or neglect of, proper air, food, warmth, shelter, clean linen and clothing, is rewarded, *irrespective of persons,* with health, or punished with disease? Your fevers stop when you cleanse your drains; your cholera mitigates its ravages when you see to proper habitations, proper clothing, and proper food for the poor; your small-pox becomes a mild and manageable disease, or is averted altogether when vaccination has been practised. The accidents on railroads diminish, when the heavy pecuniary liabilities of companies compel them to great care in the selection of able and steady servants. Explosions in coal-mines are now nearly unknown, where the Davy-lamp is properly, and always in use.

P.—I thank you for correcting me. I was going to urge another objection that I have heard uttered by men from whom one would have expected better things. But your last remarks as to the uncompromising nature of the laws, which regulate the animal frame, have already broken the force of it to my mind. It is this, viz., that it is possible to exaggerate the value of rules and regimen, to attach too much importance to the art of preserving health; that it is at best a very selfish concern; that transgressions are not so hurtful as alleged; at least, that their punishment is remote, uncertain, or of slow execution; that human experience and experimentation are all fallacies; that the effects, for example, of certain food, drink, clothing, exercise, &c., are all contradictory; that what is food for one man is poison for another; that the grand motto, "carpe diem,"—live for the day and the hour,—spare your-

self in nothing, enjoy the most, and die when your time comes. "Let us eat, drink, and love, what can the rest avail us?"

DR.—This is the essence of "fast" philosophy. It is nothing but a tissue of fallacies, as those who adopt it will sooner or later find to their cost—perhaps their ruin. Who, I ask, can over estimate health? Self-preservation is the first law of nature. Each individual should take care of his own constitution as the most precious treasure on earth intrusted to him. If this be selfishness, it is enlightened, laudable. There is nothing would relieve society so effectually of a burden of gratuitous miseries, as each man and woman taking care of his and her own health, as it ought to be taken care of. Each would fill a happier place, exercise happier functions, and leave fewer places to be filled by the unhappy! No; it is true selfishness to neglect health, *i. e.*, to hazard life—to leave successors perhaps unprovided, uncared for. Farther, to go to the grounds of the objection, I freely admit that in the domain of Physiology—in the obscure operations of life and organisation—the relations of cause and effect are often exceedingly difficult to be traced, that their phenomena are full of anomalies, sometimes appear all confusion. The enigma, however, can be solved. The discrepant effects in question, are referrible to the different bodily conditions, of different constitutions, under different cirumstances. In fact, the body acted on is not the same in any two cases. It is only imperfect observation which makes us commit these blunders of causation. A scrutinising examination, wherever we can make it, will enable us to explain many of these anomalies, *and in every case to show causes adequate to the effects, and effects commensurate with the causes.* Again, as to errors being supposed not to be hurtful, because the consequences of transgression do not always *immediately tell* or *show*, it must be observed that noxious as well as healthful influences, are often very slow and gradual in their effects. But the effect of multiplied aberrations at the least is *cumulative*—it often falls at one blow. They are only very powerful noxious agents which become instantly sensible. But there are reiterated slight excesses, or imperceptible causes, which work the most permanent ruin to the constitution. In such cases the mischief is done before danger is dreamed of. The great majority of mortal maladies are of insidious growth, of imperceptible progress. It is this that imparts their fatality.

P.—I see then how very fallacious it is to conclude, as

many hasty people do, that because any single application of a bane, or any single act of disobedience to law, does not bring forth perceptible instant fruit, is not then and there followed by direct suffering or disease, it is therefore harmless. Of all these objections and difficulties you have effectually cleared the way. One small practical one, pertinent to this *mode* of your instruction, remains—that is as to the understanding of anatomical descriptions without the *subject;* for I suppose Anatomy and Physiology, structure and function, must go hand in hand in their explanations.

Dr.—Of course they must. There can be—there ought to be—no divorce in their teaching. To separate them is to contemplate their objects under the narrowest and least interesting point of view. The truths of Physiology must be exhibited with a constant reference to the peculiarities of structure rendered necessary by the purposes to be fulfilled. But this is far from saying that I shall *bore* you with minute anatomical details and description of parts. To give these does not fall within our province, or comport with our design. I shall expound only so much of structure as is necessary to explain the purposes to which it is subservient as a constituent of the mechanism of organs. On these, and the other varied and comprehensive topics our conversation will embrace, I hope to present, in clear and intelligible terms, a complete view of the existing state of science.

P.—I am not so unreasonable as to expect that subjects that have become familiar to you, by long years of devoted study, can be fully comprehended by me, on their first broaching—how clear soever the terms which may be used. But I will give you my best attention, and will con at my leisure over and over again the lessons you teach me, till I have imbibed both the *letter* of their meaning and the spirit of their application.

Dr.—You rightly enough anticipate, that subjects so comprehensive and so complex, as those I have undertaken to expound to you, cannot be mastered *at a glance.* The diligent attention you are prepared to give them is an earnest of the practical advantage you will derive from their study. For I have most sincerely to assure you, that the reward of the acquisition will abundantly compensate the time and pains bestowed on it.

CONVERSATION THIRD.

The laws of nature, physical, physiological, and moral—Their independent, impartial, and invariable operation—How they execute themselves—The rewards of their obedience and the penalties of their violation illustrated—Their scheme and scope solve many difficulties in the moral administration of the world—Their accordance with the dictates of our mental and moral constitution.

PATIENT.—In our first two conversations you have often referred to the impartial, unfailing operation of the laws of nature, and insisted on the necessity of observing those that regulate the actions of the human body, as the only condition of escaping disease and of ensuring health. Your observations have gone far to make evident a grand truth, viz., that all mortal weal or woe is, under Providence, entirely a question of the observance or neglect of the natural laws. If it be so—and I for myself entertain now not a shadow of doubt of it—then sound knowledge of these laws —especially as touching her nearest and dearest earthly interests —becomes a matter of infinite moment to every man—indeed his paramount duty to acquire by every means in his power. Here, therefore, before we proceed further, I will be obliged to you to give me some tangible notions of their general operation.

DOCTOR.—This subject may perhaps be considered a slight divergence from our main route; but it bears so intimately on much that is to follow, and lies so at the bottom of *the philosophy of the causation of disease*, which I must presently expound to you at large, that I deem I shall not occupy your time unprofitably, if I devote a brief preliminary conversation here, to the object of placing before you, as clearly as my time, and limits, and powers will permit, the scheme and scope of these laws.

P.—It will be well-placed, well-timed, and thankfully received. I was going to ask for a definition of the laws of nature, but you before said they were mere "abstractions of the mind, *terms conveniently framed to mark our sense of the course and order of the operations of Almighty power*," which I consider equivalent to a definition.

DR.—*Nature* is merely another word for *God in creation*, in a universal sense. In a restricted sense, it means the peculiar constitution of things animate and inanimate. For example, we talk

of the nature of mucous or serous membranes, of muscle, of nerves, of the stomach, of the brain, of the lungs, of steam, of gas, &c., in reference to *the definite and invariable modes of action*, attached in the beginning by the Creator, to those and every other work of his hands. A law of nature resolves itself simply into *an invariable order in the sequence of events, or into an inseparable association of cause and effect.* Thus, bring arsenic in contact with the stomach, or any delicate tissue, as the excoriated skin, and it acts as a caustic, destroys the living texture: a hot iron, or boiling water, does the same. Throw a healthy seed at a fitting time into a fitting soil, and it grows to a plant precisely like that which produced it. Culture enlarges mental views. Injuries provoke resentment—love produces love. It is the very *invariability* of these actions which constitute them LAWS of nature. The entire business of philosophy is *to trace the connexion between causes and effects*, in other words, *to discover the laws in virtue of which any given phenomena arise.*

P.—I would call then the laws of nature, merely and simply the *unwritten laws*—moral, mental, and material—of Deity—the laws that govern the objects of creation, that determine their modes of action.

DR.—So these laws, once imposed, are evidently intended, as a general rule, to be as immutable as God himself. They are also appointed *to execute themselves*—for good, on whoever observes them; for evil, on whoever transgresses them; *and this totally without privilege or respect of person; and without palliation for the ignorant or unwilling offender.* Thus arsenic, whether swallowed designedly or by accident, and equally in the case of the *good* man as the *bad* man, will poison. The antidotes to it also will be equally efficacious in the case of the bad man as of the good.

P.—As, then, every natural object has its own definite constitution, or mode of action, these natural laws must be infinite in number, as many as there are distinct objects in nature.

DR.—But further,—the *relations* between natural objects are still more numerous than the objects themselves. This induces a great variety of *modes of action* in almost every individual object of nature. For example, the endless variety of foods stand in as many relations to the endless varieties of stomachs, and *vice versâ.*

P.—What arrangement, or division, would you propose of the laws of nature?

DR.—The simple division of the objects or existences familiar to us in nature, as follows:—

1. THE PHYSICAL LAWS, those ruling inorganic nature, as the laws of mechanics, of chemistry, of gravitation.

2. THE ORGANIC or physiological laws, those regulating the operations of living beings, plants and animals.

3. THE MENTAL AND MORAL LAWS, those regulating the functions of mind.

It is to be observed, that every law, or class of laws, *operates independently.* EACH REQUIRES OBEDIENCE FOR ITSELF. For example, obedience to the moral laws will not give impunity to the breaker of the organic or the physical laws. The most religious or upright man will disorder his body as readily and deeply as the most irreligious, by eating largely of stimulant food, drinking strong drinks, taking no exercise, and unduly exciting his brain by study, worry, or contention. A wicked man by living conformably to the *physiological laws* will have their reward—health: but inasmuch, as he lives in the daily or habitual breach of the *moral laws*, he will experience the unhappiness and dissatisfaction, that are always the associates of vice or villany. Again, a man who is anxious to make a fortune and a figure in the world, will attain his objects by fulfilling the laws and conditions that ensure success. But this will not make him a moral man, or a healthy man, unless at the same time he obeys the *moral* and *organic laws.* Indeed, such success is quite compatible with total immorality, and total want of health, and very often both are sacrificed to attain it. In the same way, the most healthy man, and the most holy man, may be a marked instance of insuccess in his worldly pursuits, because of not understanding, and not conforming to, the laws of success. A steamer with fifty saints and fifty sinners on board blows up. The proportions of the killed, drowned, and burned will be found pretty equally divided among the good and the bad,—the laws being no respecter of persons. It would be quite a mistake to imagine that the one class—the good, would be rewarded for their virtue by escaping unhurt, and the other class—the bad, punished for their vices by being selected as the victims. No; Providence is impartial in its awards. In this sense *time and chance happen to all men alike.* God causeth his sun to shine and his rain to fall, alike on the evil and the good. Seed-time and harvest are alike for both. We touch not the question of man's future state; but in this world, the observance of every law,

moral and material, meets its fitting reward; and its violation brings with it its own punishment. The superficial observer may not always trace this connexion; but a narrow investigation of the circumstance in any particular case, will show the truth of my position. A criminal may evade the course, or escape the hands, of human justice; *but the law within him*—the moral law which he has violated—asserts its claims; and he cannot silence the voice of its reproach, or extract the venom of its sting. More or less he carries a hell in his bosom, a withering of the soul at least that mars all the joys and sunshine of life, and that enshrouds to him in gloom and cloud, otherwise the brightest scenes of external nature. But even this personal penalty for moral offence, he may escape, at least mitigate by conformity to the moral laws for the future. He may cease to do evil and learn to do well. He may repent of his crimes and bring forth fruits meet for repentance. He may make restitution and atonement for injuries committed, and so he will find acceptance at mercy's gate, and pass from a state of moral death to life. Here are instances of the unswerving operation of natural laws.

P.—Your observations seem to melt away a thick cloud of darkness that has, to me, long overhung the moral administration of God in this world. They go to solve many apparent anomalies and inconsistences.

Dr.—This view of the independent and impartial operation of the various classes of the natural laws—or of each law for itself—reconciles what otherwise cannot be explained. Some religious people are staggered at the prosperity of the wicked, and the adversity of the righteous. But if the "children of this world are wiser in their generation than the children of light," there is no mystery at all in their different lots. The positions of the one and the other are equally the result of fixed laws of action—wise and benevolent laws—which the Creator himself never suspends, unless to perform a miracle. And the miracle is the old, rare, and *exceptional* rule of working.

P.—By this showing, then, the natural laws are in harmony with the dictates of our mental and moral constitution. I mean to say, for example, that if, on the one hand, vice made happy, and virtue miserable, our moral perceptions would be outraged: if, on the other hand, massive houses, founded on solid rock, soon tumbled down, because the owners were wicked people; and flimsy structures, on sandy foundations, long withstood the tempest, be-

cause their owners were good people,—the conclusions of our reason would be alike baffled. The unfailing opposite results are just what we should have expected under the administration of a wise and impartial Governor. Again, the indiscriminate implication of the good and the bad in many common calamities, as fires, floods, famines, pestilences, and earthquakes, are usually reckoned —for that very cause—the righteous suffering for the faults of the wicked, the innocent for the guilty—as mysterious dispensations of Divine Providence. But their very harmony with *law* vindicates the Divine wisdom and goodness. At the worst, more will be benefited by such events, properly improved, than those injured.

Dr.—This operation of the natural laws, in fact, affords to me one of the strongest proofs of the truth of Christianity. That a carpenter's son, after the flesh, and a few illiterate fishermen should have propounded a system of religion, found to be so curious, that it reveals truly *a light in darkness*, and in its practical precepts in accordance with the highest dictates of modern philosophy, and that this religion should have run the rapid and triumphant career it did, not only without the strong arm of human authority interposed in its behalf, but with that arm stretched out to oppose and thwart in every way—are anomalies in human history and experience, that find the only rational solution in the hypothesis of Divine Inspiration.

P.—Tell me this. Do you believe that Shakspeare, Milton, Washington, Cuvier, Broussais, Davy, and such like men, were *inspired?*

Dr.—Assuredly, *divinely inspired!* I cannot conceive of anything bearing markedly the characteristics of *good* and *useful*, or *great*, in the true acceptation of the term, but as belonging to the Creator's benevolence, and therefore *divine.*

P.—Thus you show that revelation and science are naturally allied, and that they lend each other mutual help.

Dr.—Unquestionably; for example, the objects and ends of the Gospel are promoted or obstructed by the operation of the natural laws. Thus the man who stupifies his senses by a continual course of gluttony or drunkenness, is not in a condition to hear or to receive scripture truth. *The way to the heart, in this case, lies through the head;* and in the case adduced *that* is effectually imbruted and barred up. Who are the heathen whom missionaries fail to Christianize? Those precisely who cannot be made to *comprehend*—who are stupid—who are in every sense degraded—

whose brains have not been, or cannot be, developed. The intelligent heathen will first receive Christianity, and then civilise themselves. The *brutish* and *unthinking* must first be tamed and civilised, and then they will be in a condition to appreciate and embrace divine truth.

P.—In that way, I see clearly, that all attempts to improve mankind in their spiritual, as in their mental and physical capacities, must proceed on the recognition of the natural laws as the broad basis of success. It is equivalent to planting and watering. Having done so much, we look to God to do the rest—to give the increase.

CONVERSATION FOURTH.

Man's diseases usually self-inflicted—The result of wilful or ignorant infringement of the physiological laws—"Preventive Medicine," or how to avert diseases the object of these conversations—Are diseases direct positive inflictions of Divine Providence?—The philosophy of the causation of disease—The irrefragable basis of the theoretical pretensions of the water-cure; its scientific accuracy, its practical efficiency—The principle of disturbance one and identical in the disorders of the body social, and those of the body corporeal—Neither are unalterable appointments of the Creator—Good and evil resolvable into a question of the direction of power—No evil necessary, inherent, unavoidable, ineradicable—The doctrine of the causation and cure of evil applied to the question of Disease and Remedy.

PATIENT.—I THINK the purport and the effect of our previous conversations have been to show, that the derangements of human health, as of human affairs generally, are not matters of chance or accident, but the natural and necessary results of the operation of fixed laws—the fruit of physical, mental, and moral errors on our part.

DOCTOR.—Lay this down, my dear sir, as A GREAT FACT—one which can be made out, I think, to *a demonstration*, and which it is of infinite consequence for the human race to know and to respect—viz., *that man's diseases, in the infinite majority of cases, are self-inflicted; or, what is tantamount to the same thing, are under his own control—are avoidable by ordinary precautions, and curable by common sense expedients.*

P.—Most clearly. This at once proves the necessity, and affords the justification, of your aim and design in these conversations, viz., to make them virtually and really teach *how to avert diseases*—or what you call PREVENTIVE MEDICINE—than which, it seems to me, nothing is more needed in the world.

DR.—Such is my aim. That a Prophylactic, or Preventive, System of Medicine is a necessity of the times—a great practical *desideratum* in general education—is also the opinion of many clear-headed men I have talked with.

P.—The prevention of evil is better than its cure, and generally a great deal easier.

DR.—Truly, it is easier to prevent an evil than remedy it. In all times, and among all classes, the *cure* of disease has been more a matter of anxiety than its *prevention*. The CAUSES of disease have been unduly neglected, or have received a disproportionate attention. Mankind generally—even the most thoughtful—have not studied, and therefore have not understood, the connexion between the infringement of the conditions of health, and the recurrence of disease—the simple penalty of that infringement.

P.—The ordinary and long prevalent idea has been, that disease was something intrinsically mysterious and incomprehensible; falling on helpless man by the malignity of the stars, or inflicted as the vengeful or corrective visitations of an *incensed* Deity.

DR.—Well, see the consequence of those false views! Mankind, instead of considering their diseases as the result of wilful or ignorant violation of the Creator's laws, bewail themselves in the gloom of ill-health, as either the sport of accident, as checked in their course by an irresistible fate, or as working out in physical punishment, the consequences of the commission of moral offence! *But the profoundest views of man's constitution, and of his relations with the things around him, show that his life, and health, and diseases—even his thoughts and feelings, his desires and purposes—are governed by as fixed laws as any that obtain in Physics or Chemistry.*

P.—For my part, I do not see why cause and effect in the affairs of organisation should not be as stringent and invariable as in other things. Is it not agreeable to reason, that in the microcosm of man's wondrous frame—in his diet, regimen, and diseases—in the moral world within him, as well as in the material world without—the same eternal, uncompromisable principle should hold, viz., that *according to what a man soweth, so shall he also reap?*

Dr.—Most undoubtedly. Let this principle—the teaching of simple human philosophy, but one in accord with Divine revelation—be firmly fixed in your mind, *that nothing that relates to man is subject to the arbitrary sway of accident, the fixedness of fate, the blindness of necessity, or the contingencies of chance!* No; the same regular order of things exists here as elsewhere. Disease is certainly to be avoided, health preserved, and life prolonged, by conformity to certain established laws of the corporeal constitution.

P.—But does not Scripture countenance the view that diseases are direct primitive inflictions of Divine Providence?

Dr.—Such is the view taken of them by some divines. But I believe they are wholly in error, an error men were very liable to fall into from the scanty knowledge of natural philosophy in the days when that error first arose. But this view receives no sanction from the New Testament. The teaching of Christ himself was directly opposed to it. "Think you that those upon whom the tower of Siloam fell were sinners above all others? Nay! but I say unto you that unless ye repent, ye shall all likewise perish." A young man was brought, whose infirmities were alleged to be a punitive visitation for his own sins or those of his parents. The answer of our Lord plainly negatived their theory, and showed that it was clearly an instance of the operation of the natural laws. The language will bear that construction without any strain.

No! Disease is the natural result of the neglect of the laws of the body, not their normal or intended operation. To hold otherwise would be to make Deity the author of evil—that He *wills* and *enforces* the transgression of his own constituted order of things. To view diseases, therefore, as special dispensations of Providence, *inflicted without reference to the transgression of the body-law*, is wrong in point of philosophy, wrong in the view of Scripture, and wrong in matter of fact. Diseases, I admit, may be, and ought to be improved to moral or spiritual ends. In proportion to the ascendancy of the higher and nobler faculties of human nature, over the lower and simply brute powers, in that proportion does man best realise the grand ends of his being. Afflictions, so far as they have this tendency, infinitely compensate the mere *sting of the flesh* which they inflict. In this way they are over-ruled for good; though grievous for the present, they are in the end glorious. What is in itself an evil is converted into the greatest blessing. This is in virtue of a great law of the

moral administration of God, *that evil works for good to those who make a good use of it.* I admit also that the *event* of diseases, DEATH or RECOVERY, proceeds from the Divine will. But that will is not arbitrary. It always operates through established laws, as before shown, by means of *secondary causes*, save in the case of *miracles.* But the doctrine we so impugn as an unqualified proposition, is itself repudiated by the every-day common sense acts of mankind. They are no sooner ill than they resort to the means to get well; correcting, to the best of their knowledge and power, every error or omission that may have led to their illness.

P.—Well! I give up the old view! I believe you are right—right in fact and right with Scripture, in your *Philosophy of the Causation of Disease.* But I should like you to explain your views further with reference to this point.

DR.—Gladly; and the more cheerfully, because sound views here are a great *desideratum*, as well among all sects of the profession, as among all classes of society. The false doctrine on the subject in question that prevailed among both, is the source of the humbug and QUACKERY—whether in the ranks of the scientific or the illiterate, whether in *high* or in *low* places—that is now, and has been in all times, so extensively practised and patronized.

The discussion we have now to enter upon would, if the ability of the advocate were equal to the justice of his cause, set in a very clear point of view, to every intelligent mind, the *broad irrefragable basis* of science, of philosophy, and of common sense, on which we rest the pretensions of the water-cure. Let me, by anticipation, term it THE TRUE HYGIENIC, OR PHYSIOLOGIC SYSTEM OF MEDICATION. You will afterwards, when you have seen its grounds, admit its full claim to that high designation.

These pretensions *we do not rest* on the *successes* it has already accomplished, brilliant though these be, and confessedly beyond all compare with those of any mode of treatment ever before practised. No! This is not the ground of *our* faith in the simple water-cure, and of our hope of the ultimate curative triumphs it is destined to achieve. The present is but the infancy of the system, how vigorous and promising soever that infancy may be; and that even a greater ratio of cures does not take place, may be justly set down to *the faults of* the patient, or the errors of the inexperienced practitioner, and not to the treatment itself. Moreover, consideration must be made for the many *incurables* who seek its aid as a *dernier ressort*, as well as the many vexatious faults, and omissions

and commissions, of patients who otherwise might be satisfactorily relieved or speedily cured. This may be, or may not be. What we insist upon, *now*, as of infinite consequence—not to say of infinite presage—to the ultimate success of the cause, is the irreproachable, unassailable soundness of the Water-cure THEORY.

P.—I do not recollect that any of your brethren of the "old school," who have assailed Hydropathy with jibe, and banter, and ridicule, and *falsehood* enough, have ever ventured to break a lance with you on the field of fair argument.

DR.—Never. On the contrary, some of the great men, and the dispassionate thinkers, in their ranks, have paid the tribute of their testimony to *the philosophic accuracy*, as well as to the *practical efficiency* of the curative PRINCIPLES we contend for—principles that *must* be true, practice that *must* be efficacious, *because based directly on the laws of the human constitution!*

P.—All sound theory *must necessarily* lead to sound practice, and just in the degree of its soundness.

DR.—Yes! This is the rampart of the "Water-doctor," and the recommendation of his practice to all right thinking men.

P.—A strong rampart, I trust, to the one, and a satisfactory recommendation to the other. But after this preamble, come to the point. You have got here, doubtless, some great foundation-truths to announce.

DR.—I have. This subject may seem at first to diverge from our route, but it does not. We have to analyse many confused elements we see around us, and to get to the bottom of matters. It will exact from you some patience and attention to hear, from me some clearness and consideration to expound. I hope to establish, and place in a striking point of view, a series of pregnant TRUTHS, which it well behoves mankind to ponder, and not only to ponder, but to reduce to practice, and to teach to their children as their first great lessons in the school of the world.

P.—I shall give you my best attention. By your hint at "the confusion of affairs," I imagine you are going to point out some analogy between the disorders of the little world of the human body and those of the mightier world, and not less complicated fabric of human society.

DR.—Such analogy is very evident. The great practical point is to ascertain the *source* of the derangement in both cases——

P.—On the principle that the knowledge of the cause of a disease is half the cure.

DR.—Quite so. It will be established, beyond all possibility of contradiction, that as the *principle of deviation or disturbance* is one and identical in the disorders of the body corporeal and in those of the body social, so the *principle of rectification or remedy* which applies to the one holds exactly with the other. *Neither the confusion of human society, nor the derangements of human health, are unalterable appointments of the Creator, or the intended operation of his laws!* They are PERVERSIONS; acknowledging an *analogous* origin, claiming an *analogous* cure. They are simple results of ignorance of the Creator's laws, legitimate fruits of their violation.

P.—That point can now be no longer disputed. You have made it very plain that men make their own weal or woe, their own bane or blessing in this world.

DR.—Yes; just as men observe or depart from those conditions of things, according to which they become sources of good or evil. The root of all man's calamities is, that he does not exercise his god-like gift of reason as he ought; that he does not employ it in ascertaining and *acting out* his practical duties; in studying the nature, and fulfilling the relations of those external influences, to whose operation he is every moment subjected, and which moved him to whatever he is for good or for evil—for good, if he places himself in harmony with those external influences—for evil, if he assumes a false position to them. No other view of the matter is compatible with human liberty or free agency.

P.—Does this principle conflict with Scripture at all?

DR.—No! on the contrary, it is that recognised in the whole of the Divine dealings with man there recorded. The way of blessing and the way of curse are clearly propounded. Look at Moses' remonstrances with the Jews—the glorious things promised to obedience, the disasters to disobedience. Look at the entreaties of the prophets with that erring people, on the same grounds. Again, the higher privileges of the Christian dispensation are set before men equally as matter of free-will. They are addressed as competent to choose for themselves good, and to reject evil. Nobody is *fated* to be happy or unhappy—to be so forcibly, necessarily, and *irrespective of conditions*. "The bed that we make for ourselves we must lie down upon." If mortals are miserable, it is mortals' fault: error or disobedience to law is at the foundation of it: let them see to it. Ample are heaven's provisions for happiness to all creatures.

P.—All this stands to common sense, and is corroborated by common experience.

Dr.—Your clear conception of matters so far, prepares you to comprehend the question of the *causation of disease.* We have already sufficiently insisted on it—it is no longer a matter of question—that all departments of creation, are framed and managed with reference to the great fixed laws, *i. e.*, all things, whether moral or material agencies, have a specific constitution or mode of being and action appointed to them. I call this original constitution of things, THE ORDER OF NATURE. The violation of this order, non-compliance with its conditions, introduces DISORDER.

P.—What do you mean to build on this?

Dr.—An irrefragable truth, deduced from the largest survey of the Creator's works and ways,—the fundamental principle, in fact, of the Divine administration of the affairs of the world, viz., *that the observance of the laws of the constitution of things, produces only* GOOD—*maintains* THE ORDER OF NATURE.

P.—While it vindicates the wisdom that planned that order of things, it also, doubtless, fulfils the ends of Nature.

Dr.—Yes! it secures the best interests and highest happiness of every creature. On the contrary, *the violation of the laws of the constitution of things produces only* EVIL, *i. e.*, INVERTS THE ORDER OF NATURE.

P.—Spoils her operations, baffles her ends.

Dr.—Yes, forfeits, more or less, the happiness and well-being intended and provided for every creature by Divine wisdom, power, and benevolence.

P.—I see nothing unorthodox in this doctrine—nothing derogatory to the character and perfections of the Supreme Being, in this order of things. But for the practical application of this doctrine—how bears it on the question of disease and its remedy?

Dr.—Intimately, and all in all! It is very plain, that if human affairs are under this great law, that the supervention of diseases must be matters of *law*, not an affair of *chance.*

P.—You have repudiated altogether the idea of CHANCE as ruling human destiny or condition. Your doctrine makes it out that if a man be healthy in his body, at ease in his mind, happy in his family, esteemed in society, and flourishing in his circumstances,—that he is so, in each of these, *so far as the laws ensuring these good results have been obeyed.*

Dr.—Most unquestionably. And so much are we still in the

infancy of the world, notwithstanding all our boasted civilisation, so great is the confusion and collision, of human interests and feelings, that were not intended to clash, but to harmonise—that society is little better than a chaos—so little are the laws of the constitution of things ascertained and acted on. And so little, let me add, is the Gospel practically carried out among mankind; for its precepts and principles may be summed up as a compendious enforcement of *obedience* to every law of our nature—moral and material. And it is this singularity which distinguishes the Christian religion from all others, which shows its precise adaptation to the wants of human nature, and proves its divine origin. The physical laws we have no revelation on. These our faculties are adequate to find out for themselves. But "who by searching can find out God?"

P.—Men put this divine guide aside, or extinguish its light. They are then the victims of the abuse of their faculties.

Dr.—Too true. The order and ordinances of nature are hardly understood, and at best imperfectly carried out in any matter. All the miseries, all the diseases, all the crimes that disfigure the face of society, are traceable to the violation of this order.

P.—*Of course from not understanding it!* Men do not *willingly* choose to endure evil when they might enjoy good.

Dr.—Oh! but they do. The *understanding* is often as much at fault as the *heart*. Ignorance, and the moral and social degradation it entails, together with the habit of slavish feeling and opinions, of preferring tinsel and trumpery to gold and sterling merit, the long preponderance of the appetites over the intellect, so imbrute and blind the mind, that evil is perversely chosen, and good refused, or rather the one is misapprehended for the other.

P.—Ignorance, you make it out, is the source of the evil. Knowledge is the remedy. I am to conclude, then, that sorrow and suffering will continue to be the portion of the human race, so long as the cause—*the inverted order of Nature*—operates?

Dr.—And will only finally disappear by knowledge and the observance of law—THE ORDER OF NATURE *ascertained and acted on, in all things, by all men.*

P.—Your doctrine then affirms, as clear as words can make it, that THERE IS NO INNATE, INHERENT EVIL IN THE WORLD—no evil, *per se*, "pure and simple," as the French would say, no evil necessarily unavoidable and ineradicable—no evil, in short, existing by any decree of Deity that it should exist?

Dr.—You have it. I maintain that the Divine decree is only good—on all men, and to all creatures. Evil—*the inverted order of things*—the dislocation, disseverment, and confusion of the moral and material mechanism of society, which we observe, *is man's work*. So far as Deity is concerned, the pre-established harmony of the Creation is perfect. No contingency is unprovided for. No re-regulation of what *at the first* received its appointed constitution and laws is necessary. But it is man's perversion of things that renders them evil—the violating of the natural conditions on which benefit is derivable from them—disjointing them from their proper connexions, alienating them from their proper purposes, using them in ways they were never designed for. In short, the whole question of good and evil turns entirely ON THE DIRECTION OF POWER.

P.—*The direction of power!* There is something in that. This is bringing us down to the foundation of the matter. How, then, would you philosophically define EVIL?

Dr.—AS THE RESULT OF THE IMPROPER DIRECTION OF POWER, *i. e., the devious or deviated course of Nature—the perversion of her gifts—the misapplication of her agencies*—or what is tantamount to this,—THE BREACH OF THE LAWS OF THE CONSTITUTION OF THINGS!

P.—By parity of reasoning, then, you would define GOOD as THE RESULT OF THE PROPER DIRECTION OF POWER; *the direct course of Nature; the due use of her resources;* or, what amounts to the same, THE OBSERVANCE OF THE LAWS AND THE CONSTITUTION OF THINGS!

Dr.—Precisely so. If you will hear me out, we shall apply all this presently to the question of disease and cure. It rests with man to make or mar his own happiness, according as he properly or improperly directs the power—his own or others—placed at his disposal; according as he uses or abuses the bounties of heaven, profusely scattered around his path, wherewith to gladden the journey of life, to lighten its toils, to improve his condition, and to exalt his nature. If man suffers in any point, in any respect, in any degree, it is only from the non-observance of laws, and this precisely in the direction of the law broken, and according to the nature and extent of the breach. Thus moral suffering *primarily* and *principally* follows moral offence; physical suffering is the fruit of physical injury, and social suffering the penalty of offence against the social laws.

P.—By the qualification of your last sentence, "primarily and principally," I perceive that you mean to imply that *the direct and primary disturbances do not constitute the whole penalty of violated law.*

Dr.—I do mean so. It is an old axiom, that neither good nor evil ever comes alone in this world. They are never isolated. They cannot reach a man from any point without bringing with them much collateral and dependent good or evil. All events hang by a chain of necessary sequences—one receiving its support from the preceding, and lending its hold to the next. Evil once let loose is like a floodgate that has burst its barriers. There is no saying where the unrestrained waters will sweep to—what havoc produce. It is thus with disease in the body: one organ cannot be affected isolatedly; but its morbid condition must, more or less, implicate and derange the whole organism.

P.—Well! To make all this philosophy bear on the grand question of the Prevention and Cure of Disease. You affirm that what is true regarding man's *external* circumstances in the world, holds with equal truth regarding his *internal* or corporeal condition.

Dr.—They have precise analogies. Coming then to the practical application of these abstract principles, I contend that as the breach of any specific law, or class of laws, is the cause of any specific evil, so the observance of the very same laws that have been broken is the only way to remedy the evil, or to suspend their punishment. Thus the neglect of industry and economy, and the failure to cultivate the intellect, and to discipline the higher, and to curb the lower powers, will produce poverty and crime in any individual, or class of individuals; so the remedy of that poverty and crime consists simply *in retracing the deviated steps*—in observing sedulously those laws of industry, of intelligence, of mental and moral culture, the neglect of which produces the evils in question. In the same way I contend, that the observance of the physiological or organic laws, is the essential condition of human health; as their non-observance is the almost alone source of its derangement.

P.—I am to conclude, then, that the prevalent diseases of society are not visitations of Divine vengeance, for the sins of individuals or communities, but are the simple, natural, and necessary consequences of violated physiological law. In this sense, it may

be affirmed, "every man's sins find him out:" thus again harmonising philosophy with revelation.

DR.—Your conclusion is perfectly right. I don't know how it can be questioned, much less rebutted. Having noticed already the religious bearings of this question, I shall not again revert to that topic here, further than to say, that as *all* TRUTH has the same Author, *moral* truth and *material* truth can never antagonise or thwart each other, and those who are inclined to dispute, if they analyse the difference between us, will find it resolve itself into a *dispute of words*. The foundation standeth sure. The man who, however much injured, can forgive his enemy, soon feels a mental solace, whether this forgiveness proceeds from philosophical magnanimity, constitutional benevolence, or blind obedience to the divine ordinance. This shows that Christianity is in accordance with man's moral and material constitution, and that obedience to its laws and teachings, is at once followed by an adequate reward.

P.—Before concluding this conversation, which I have found neither tedious nor uninteresting, will you give me a brief summary of the chief physiological laws you have in view, as mostly infringed by man's ignorance or wilfulness.

DR.—This is anticipating, perhaps, our future conversations. But I shall simply state that these laws are based on the relations that obtain between each organ and the whole organism, and the modifying influences of the external world from which that organism receives its materials of growth and maintenance. Those influences are acting on us at every instant, from every quarter, and under every shape. They comprehend the food we eat, the fluids we drink, the air we breathe, the sleep we take, the raiment we wear, the houses we inhabit, the connexions in life we form, the part we play on the great or little stage of the world; in fine, they comprehend the uses to which we devote our voluntary powers, our physical strength, our mental energies. These are the grand "MODIFIERS" of our organism, determining not only intimately, but *all in all*, its condition whether of health or sickness.

CONVERSATION FIFTH.

The Philosophy of remedy—The true agency of cure in disease—The powers of nature best trusted—The great compensation principle, or set-off to evil, applied to the Art of Healing—The law of inherent remedy, or of self-rectification—Bane and antidote placed in juxta-position.

PATIENT.—In our last conversation you expounded pretty clearly, and quite satisfactorily to my mind, the foundation on which it has pleased the Creator to place good and evil in this world, *demonstrating the* GENERAL PRINCIPLE OF THE CAUSATION OF DISEASE; placing that question, in fact, on its proper footing, and vindicating the ways of God to man. Will you, to-day, be so kind as to give me your views regarding the GENERAL PRINCIPLE *of the cure of* DISEASE?

DOCTOR.—Most willingly. There is a *grand curative principle in nature, or law of remedy for evil*, revealed by proper views of the *causation of evil*, which can be exactly applied to determine *the true remedial principle* and *agency* in the cure of disease. Contemplating the simplicity of means, wisdom of design, and beneficence of result, that characterise the arrangements of Deity for the welfare of all that His hands have formed, we should, *à priori*, expect, that a remedial method of nature would be marked, pre-eminently, by the same qualities; and, *moreover be placed in close proximity to, if not side by side of, the erring influences it was designed to correct.* If a fever, caught in the marshes of Essex, or in the fens of Lincolnshire, was only to be cured by bark brought from the wilds of Peru, we could not reconcile a provision of this sort with Divine wisdom or benevolence.

P.—We could not. But is this *à priori* expectation fulfilled in the present instance? *i. e.*, in the question of the natural remedy of diseases—*if there be such.*

DR.—The expectation *is* fulfilled! Most unquestionably there exists a *great Principle of Remedy*, or *Law of Cure* written in all the works of Nature, made clear in all the ways of Providence. It is an inevitable consequence of the true philosophy of the derangements of man's present estate, *that the causes of evil should involve, and do involve, the means of cure!* This is a fact beyond all contradiction. If so, it exhibits but another proof of

the wonderous care, the beneficient provision of Divine Providence, for the welfare of His creatures. By this, *the disease is made to suggest the remedy*, a remedy not far off, but in juxtaposition with it, not *foreign*, but *kindred* in nature, co-extensive in power, and parallel in its operations, *but reversed in direction!* So that, if, on the one hand, we have to deplore a wide-spread *Bane*, which poisons or embitters the cup of mortal happiness, we have, on the other hand, to rejoice in an *Antidote* of adequate virtue to extract the venon, or to overpower the bitter.

P.—Good and evil, on alternate analysis, as you before showed in yesterday's conversation, was entirely resolvable into a question of the *direction. The order of Nature, you proved, was power working legitimately, normally, or in the proper direction.* Disorder in Nature (or rather in society, for Nature's ways appear to me, when unperverted by human devices, are all order,) you proved by the same reasoning, *was power working abnormally, or in an improper direction*—good being the result in the one case, evil in the other.

Dr.—Yes; that is precisely my theory, or analysis of the matter. If it be correct, if evil be always the result of deviated or perverted power, it follows, on the plainest showing, that the cure of any given evil must consist *in the proper direction and development of the very same powers whose deviation produced the evil.* This stands to sense. Applied to the disorders of the body, it shows, demonstrably, the true *principle* and *agency* of cure.

P.—The practice of this principle, or the recognition of this agency in the cure of this disease is, I believe, no novelty in medical art; for there have been, in all times, physicians who have trusted in a great measure to, and have had great faith in the powers of Nature, when undisturbed by sinister influences.

Dr.—I freely admit all that. The "*Water-doctors*" don't pretend to be the first who have placed their chief reliance for the cure of disease on those powers *when properly invoked, drawn out*, and *aided.* But I contend that I am the first who has based and defends this practice on these grounds, *theoretically.* I give a reason why, in the treatment of disease, the powers of Nature are best trusted. From being an empirical trust in nature, as it has been hitherto, I show that in treating disease on the simple, but efficient principle I practise, that I am conforming exactly to the great *natural law of cure.* This is much to say. But it is totally different, and false ground to take, when a practitioner says, I

treat disease in this or that way, *because my experience tells me it is best.* This was the chief defence of the simple drug*less* cure beforetime. The allopath and the homœopath vindicated their practice by the same reasoning. Experience, at best, is fallacious, and this proverbially. *We* do not practise our simple *Hygienic* or *Physiologic cure*, on the ground that experience demonstrates it to be the best, although *that* is a GREAT FACT, but because this simple mode of treatment *obeys the only true law of cure*, recognises, exclusively and prominently, the great *remedial principle* and *agency* of God and nature, viz., *help from within.* This LAW I shall call, henceforth, for the sake of distinction, THE LAW OF INHERENT REMEDY, or *the principle of self-rectification.* There is no other sound remedial *principle.* Its feasibility in theory, and its efficiency in practice, are attested by the experience of all mankind, who apply it invariably and successfully, to the rectification of every derangement of their affairs, *save always the derangement of their health!* This is a remarkable exception, and one made not less unreasonably than injuriously. At another time we shall discuss the cause of this strange anomaly in human nature. Ignorance on the part of the laity, irreflection on the part of the Profession, lie at its foundation.

P.—In all that you have said, there is much for mature consideration. You certainly place old and common things in a new and uncommon point of view. I cannot see aught to object to your *philosophy of remedy.* And I can clearly perceive how it *tells* in the defence of the hydropathic; a system, you allege, which invokes exclusively *help from within*, in other words, the powers of nature; a system which studies never to injure those powers, but always to heal them, to liberate them from disentanglements, and to give them free and full scope. I have read all that the advocates of the Water-cure have written on behalf of their simple method of treatment, but never before has the question been argued on this high ground—ground, I suspect, your opponents will find great difficulty in assailing. But I have interrupted you: go on. I am much interested in this new exposition of the philosophy of remedy.

DR.—The whole problem of the cure of any specific evil under which mankind labours, is *to ascertain the deviating power; the point of deviation, and the causes of deviation; and then to seek by every agency sanctioned by science and by common sense, to remove those causes and to give the proper direction or develop-*

ment to the erring power. Analyse any successful mode of remedying any mortal evil, and you will find it resolves itself into this. A thousand illustrations may be given; for example, in the delta of the Mississippi, it occasionally happens that the river bursts its barriers—the *dyke*, by which the inhabitants of New Orleans protect their low-lying city from inundations. The point where the dyke yields is called a *crevasse*. The evil to be remedied is the flowing of a miniature-river through this, to the submerging of the city, and the destruction of property. The dyke is the deviating power, whose yielding produces the evils complained of. The *crevasse* is the point of deviation. The cure consists in strengthening the dyke, filling up the *crevasse*, in other words, giving it the proper development or strength—building up the breach if possible—thus giving the proper direction to the erring power—making it adequate to restrain the river within its own limits. A *charm* or *specific* is not called for in such a state of things, nor believed in by reasonable people.

Another example. In a gas-lit house, a room is found filled with gas, and danger thereby incurred to life and property. Here the gas is the deviating power. The ruptured or open pipe is that which has produced the deviation. The point of deviation, that whence the gas escapes, and the cause, are the first things to be discovered in order to the remedy of the evil. The deviating power will be restrained by closing the tap or mending the ruptured pipe, and not by lamentations or calls for aid.

Again. The vagrants of society are instances at once of deviated moral, and mental, and physical power. 1st. They are idle—society is deprived of the advantages their labour would confer,—both on themselves and others. Here physical power is deviated from its proper direction, honest industry, and turned into wrong channels, that of begging, thieving, and wrong-doing of every sort. Their mental power, instead of being directed to attain excellence in any trade or calling is only ingeniously perverted to schemes for appropriating their neighbours' property. How much their moral power is perverted or maldirected needs no comment or illustration.

Again. A district of country, a street of a city, or a village, is unhealthy, through bad drainage of the soil, the filth and bad ventilation of the houses, and the poverty, low diet, bad habits and mental distress of its inhabitants. Here the deviating powers are those of the human frame, the question is that of bad health induced. The points of deviation are those where unhealthy natural

stimuli: viz., bad air, bad food, and depressing mental influences,—come to *tell* upon the body. The causes of deviation are those same injurious influences. These causes must be removed: proper drainage effected; cleanly raiment, cleanly persons, cleanly habits, cleanly houses substituted for the reverse; nutritious food substituted for *garbage and tipples;* moderate labour insisted on for the toil-worn, on the one hand, or the indolent on the other. In this way the proper direction and development will be given to the erring organic and physical powers, and *health* will thus speedily take the place of *disease.*

In virtue of this great *law of self-remedy* contained in the very constitution of things—by giving their full and proper scope to those powers whose deviation produces evil—society, *compared to what it should and could be,* is now a mass of confusion, misery, and disease, contains—in consequence of the Creator's own ordinance and footing of things—its *own principle of regeneration.*

P.—In this statement, is there nothing conflicting with the mission of the gospel?

Dr.—I think not. Its end pre-supposes the co-operation of human with divine instrumentality. St. Paul "kept his body under" *that he might be the freer in spirit,* and better accomplish the objects of his sacred calling. He "laboured more abundantly" than the other apostles, in the conviction that the success was accorded in proportion to the efforts made to secure it; that the natural law of cause and effect upheld spiritual agency. "Except these abide in the ship ye cannot be saved." There is a well-founded hope that mankind will see the correction, even the extinction, of most of the ills under which they now groan. Philosophy expects this result, and Scripture promises it. The approximation to it may appear slow to short-lived man; but the event is certain. Already we live in the dawn of a brighter epoch. The morning is not without its promise that the glorious sunshine of day will break on a long night of barbarism,—for the better parts, and of real barbarism for the worst parts, of the world; and a new destiny open up to future men. We only now begin to interpret nature's purposes, to seek her ends, to unfold her resources—which are in one sense, the purposes, and ends, and resources of the Almighty, *laid at man's disposal.* The instruments of this elevation of man to the intrinsic capabilities of his nature, and to his true position on the globe, are KNOWLEDGE (human and divine), PERSEVERANCE, and the PROPER DIRECTION OF POWER.

CONVERSATION SIXTH.

The Law of Internal Remedy applied to the disorders of the human body—The Water-cure recognises the exclusive curative agency of nature—The whole effect of its means and appliances to give the normal direction and development to the powers of nature—The function of the physician in the cure of diseases—No short-cuts to health.

PATIENT.—I MUST confess myself equally surprised and delighted with the light in which you place your great *compensation principle*, or set-off to evil in the world. Applying it to physic, to the healing art, is quite a new idea. I will study it more than I have done, as that which contains the seeds of the future regeneration of society; *i. e.*, as a co-worker with the principles taught in the Gospel, whose universal diffusion is to be effectual to that end. You have unquestionably evolved a great principle of the Divine administration of human affairs—one as benignant, as potent, in its provisions. Only Omnipotence could divise a principle that could *so* induce GOOD from EVIL; that could *so* make the BANE carry with it the ANTIDOTE; that could *so* in the CURSE wrap up the seeds of BLESSING; that could *so* convert the agents of DISEASE into the instruments of HEALTH; that could *so* wield DESTRUCTIVE FORCES that they should be turned into CONSERVATIVE POWERS; that could *so* bring matters about that the ROAD TO RUIN, reversed, should become the WAY OF SALVATION. But resume, if you please. You were going to apply your LAW OF INHERENT REMEDY to the disorders of the animal fabric.

DOCTOR.—I was proceeding to show that the living organism forms no exception to this law. It, in fact, finds its most beautiful illustration—in the case of corporeal derangement—in the prompt, facile, and beneficent means instituted by the Creator for its restoration to health.

I hope I have clearly made it out, that there is an exact analogy, between the cause and cure of the disorders of the living body, and those of the body politic, or any other disturbed course of matters cognisant to man. "Mal-direction of the organic powers," I argue, "produces disease; and the proper direction of the same powers, therefore, must bring the remedy." This doctrine is alike justified by common sense and enlightened experience. It is the boast of the Water-cure, that it pre-eminently recognises and calls

upon the exclusive curative agency of nature; *i. e.*, of the organic powers; and the whole bent of our "means and appliances" goes to exalt those powers, to rid them of all impediments to their free and full action.

P.—In this way, your practice vindicates and bears out your theory; for it is entirely aimed at giving a proper direction to the deviating or wrong-directed powers of nature in the living body.

Dr.—You quite apprehend the genius of the Water-cure; and see the gist of my defence of its simple agency, of the exclusive reliance on the powers of nature. But to continue; and to be more explicit. The mal-direction of the powers of the animal system, implies the withholding from them the due conditions they require for doing their work. The healthy or unhealthy action of the stomach, bowels, liver, lungs, skin, kidneys, brain, nerves, muscles, &c., depends on whether or not they be exercised conformably to the laws of the constitution of each organ. Certain external stimuli, are appointed by the Creator to act upon them—as food in the stomach, and food of a certain quality in relation to the powers of the stomach; so air in the lungs; and air of a certain quality, in relation to the office of the lungs; so blood of a certain composition in relation to the structures it is to nourish, and to the glandular organs provided to act as the strainers of its refuse; so exercise on the muscular and nervous systems, &c., without which, the vital properties of the machine would soon be exhausted, and its play come to an end.

P.—Well. How does man impress a mal-direction on the powers of nature; *i. e.*, on the powers of his body?

Dr.—Simply, as I have said, by exercising them unconformably to their laws of constitution and relationship, by withholding from those powers the due conditions they require for executing their functions. For example, taking improper food, improper quantities, and at improper times. So improper fluids are freely used as daily beverages by thousands, and considered as essential to the maintenance of life. In the same way, improper air is breathed; the skin is denied fair play for its functions by uncleanliness, or excessive clothing or muffling, or by the want of due precaution,—in this way the liver and kidneys, and the lungs too, are tasked beyond measure,—to strain off from the circulation,—matters that should never have been allowed to enter it; or one overworked to supplement the impeded functions of another. The muscular system with many is exercised continuously and excessively beyond all

power of normal repose, and with others, is never exercised at all; the nervous system with infinite multitudes of mankind, is kept in a state of morbid tension, through undue addiction to study, business, or pleasure. In all these, and sundry other ways, I need not at present mention, the course of nature is made to deviate, her operations baffled, and their products perverted. What is the wonder, then, that we complain of feeling ill—"of a screw loose" here and there; that instead of quiet unconscious digestion, we have bouts of stomach-malaise, as regularly as every week comes round; that instead of calm brains, we are anxious and irritable almost to madness; that instead of a cool, sleek, smooth, soft, perspirable, "flesh-coloured" skin, we have it burning, or dry, or scaly, or blotched all over with eruptions, and of every hue of disease, yellow, pallid, or speckled, and shivery, &c.; that instead of tranquil slumber, we have nocturnal fidgets, and wearisome tossings about for hours, with fitful snatches of heavy, dreamy, unrefreshing sleep; and so on through the whole catalogue of mortal plagues?

P.—All this clearly proves your doctrine—the necessity of giving their normal and legitimate direction to the powers of nature, by affording them (as your system so entirely aims at) the most favourable conditions for their healthy exercise.

Dr.—What those conditions—the conditions of maintaining health—are, every tyro in physiology can tell, viz., proper food, proper drink, proper air, proper exercise, proper repose, according to the diversified circumstances of each individual case. When the balance of health is deranged, then our procedure is different; because, although these simple measures alone would, in a multitude of cases, suffice *with time*, yet, with the majority of patients, *time* is the object to be gained at all hazards, at any expense. So we proceed to do in a month or two what would otherwise take six or more months to accomplish. In all bodily derangement, the equable distribution of the blood is first palpably interfered with, the functions of the excretories are implicated next, augmented in one place, diminished in another—in all perverted; and the object is to equalise the circulation, and to open outlets for the retained waste and other elements in the body. The drug-doctor tries to accomplish these objects by bleeding, blistering, &c., and medicine that excites a violent action of the bowels, kidneys, or skin—*internal irritants.* Now the "Water-doctor" accomplishes the same objects more safely and successfully, chiefly by making

the skin the great field of operations. This is the greatest outlet of the body, and the fittest for being acted on—responding best to our call to it for aid—when the object is either to equalise the circulation, or to eliminate retained excretions. I admit the occasional expediency of an emetic or purgative in the beginning of some acute fevers, the use of antidotes to poisons, and the advantage of the so-called specifics, mercury and sulphur, &c., as valuable *adjuncts* of treatment in certain refractory diseases. Castor-oil, too, is a valuable medicine, occasionally, in chronic diseases as well as in acute. But I have observed, that most medical men visiting Water-cure Establishments, are surprised to find, how few are the indications for the use of drugs, during a judicious course of Water-cure treatment. The true philosophy of curative science dictates no more to be done, in order to place or keep nature in her straight course, and to repair the mischiefs of her devious course—to ensure, in short, the fulfilment of her own exclusive and untransferable function—HEALING.

P.—This showing of the matter clearly defines the duty of the physician, as it points out his share in the great business of cure —what he should do, and what he can do; what he should not do, and what he cannot do.

DR.—Through a fatal mistake in theory, and with a correspondingly disastrous result in practice, he generally does a great deal more than nature exacts of him, or than true science justifies. Nine cases in ten, he tries to correct the body's deviations by a *tour de force*—a resort to powerful drug medication. What is the result of this meddlesome interference? It is to treat the sick body, as that bankrupt would his ruined affairs, who should seek to retrieve them by a *stroke of luck* at the gaming-table, or the lottery-box! The analogy of the two cases is perfect. Once in ten thousand instances, a desperate state of affairs may be remedied by a desperate "stroke of fortune." Precisely in the same way, now and then, corporeal derangement may be rectified, organic bankruptcy averted, by a lucky hit, or a blind act of drug experimentation, whose success, moreover, the practitioner cannot at all explain. These favourable issues of a hazardous neck-or-nothing expedient, are the exceptions—*the rule* is failure, *i. e.*, one prize to ten thousand blanks. The remedial resource in neither case is that sanctioned by science, by common sense, or even common experience.

P.—So it seems, as a general rule, there are no *short-cuts* to

health any more than to wealth! It would appear, that it is seldom things can be made *pleasant* in that way.

DR.—No, certainly not; on the same principle, as there are no royal roads to knowledge. As men redress their disordered affairs, reconstruct the fabric of their wasted fortunes, *not by specific remedies*, but BY THE PROPER DIRECTION OF POWERS, *i. e.*, by honest painstaking labour, by the development of the resources of industry, by minute and conscientious economy; so, in a perfectly analogous way it is, they reconstruct the wasted bodily fabric, and recruit the lavished resources of their constitutions, *by the proper direction and development of the bodily powers, and by the retrenchment of all superfluous bodily expenditure.*

P.—Thus, I perceive, are the heavy mortgages of the body only to be paid off, and the estate redeemed, by the industry and retrenchments of the borrower. Fresh loans at high interest, in other words, temporary fallacious relief from drugs, according to your reasoning, are as unsound in principle as inefficient in end. So that the conclusion of the matter you force upon me is, *that the powers within—the regulating powers of nature's own processes, properly directed, are all in all in the question of* CURE.

CONVERSATION SEVENTH.

Are there Specific Medicines?—No extraneous remedial agents—Idea of specifics a fallacy—The reason why drugs fail to cure—Drug-relief often a simple postponement of the evil day—Symptomatic treatment—On relief of symptoms at the expense of injury to the vital powers,—not a curative proceeding—The kind of aid nature needs—The art of healing consists in eliciting the power of self-repair.

PATIENT.—A QUESTION growing out of our last conversation here occurs to be discussed. What say you on the subject of *Specific Medicines?*

DOCTOR.—Theoretically and practically—in point of philosophy and in matter of fact—*they are a grand mistake!* Yet in this bootless search, in the pursuit of a pure phantom of the imagina-

tion, thousands have wasted long and valuable lives (their own), and sacrificed tens of thousands of perhaps more valuable lives,—(their patients). How many a bright luminary of mankind has been thus prematurely quenched! But let that pass. To our present question. I am anxious that it be once for all laid down, and firmly established in your mind, and in every intelligent mind, if possible, as an irrefragable truth, *that there are no such things in nature as specific remedies.* If it were so, if such existed, *it would be a solecism in the Divine government of the world.*

P.—How a solecism in the Divine government? Explain yourself, if you please.

Dr.—Because the principle of specifics involves the idea of a sort of dispensation from keeping the laws of Nature. It is virtually an attempt to give the go-by to these laws. If a man who brings on a fit of indigestion by excesses of the table, or an attack of acute illness, by a fit of debauchery, can neutralise the effects of his indiscretion by swallowing a pill or a bolus, what check is there to transgression?—if the penalty of the violated organic laws can be so bilked by a dose of medicine, to what purpose are those laws imposed? This is again the question of retrieving a ruined fortune by the lottery. But the penalty of Nature's violated laws, is not so to be dispensed with. It must now be as clear as the noon-day there is no real curative virtue, there can be no power, to restore disordered action of the body, in substances that are extraneous to the body, that go to form no part of its component structure, or that do not constitute the natural *stimuli* and *sustainers* of vitality. Such substances I admit may quell a symptom—an acid may neutralise an alkali in the stomach, and strong intestinal irritants, as colocynth, may cause violent contractile efforts of the bowels, so as to expel flatus or overcome constipation, digitalis may slacken an excited pulse, or alcohol temporarily elevate depressed spirits. But *cui bono?* These are not curative results, nor the means of soliciting nature's curative efforts. On the contrary, they are injurious, only introducing elements of fresh confusion into the disordered body. There is not—*there cannot be*—I affirm without any fear of contradiction, *any* EXTRINSIC *remedial agency, or source of corporeal restoration.* Salvation here, as in all things else, must be *from within*—an effort of the inner powers responding to the external conditions and means. Extrinsic help, like the system of loans and mortgages, is false and fallacious help; it is, at best, only temporary, and in

its remote results is often ruinous. The power, whether of the body politic or of the body corporeal, that is buttressed up by help from without, must fall sooner or later of its own weakness, and always when its props are withdrawn.

P.—But is not the *temporary* help something—is it not indispensable in many acute, and in some chronic diseases? Are not the common sense and common experience of mankind against you here? Can we dispense with castor-oil, pills, purgative draughts, calomel, and opium, even the lancet and blister, &c.?

Dr.—I have already admitted the *exceptions* to my general rule. Temporary drug-help may be and is occasionally expedient. But in ninety-nine cases in a hundred it may be dispensed with. It is the *impatience* of both doctor and patient that most frequently calls in the aid of drugs; and they are generally sure to produce some temporary mischief and malaise, some derangement of the alimentary canal, that more than compensates any fleeting relief they afford. But in most cases, I contend, medicines can be dispensed with, and ought to be more sparingly used. Repose in bed, with fomentations and other water processes—and remedial adjuncts which do not injure and thwart,—will gain every end, and leave the system in perfect quietude to put forth its restorative energies.

P.—In the analogy you have used above, I think I catch you tripping—for once at least. You say salvation in matters of health, *as in all things else*, must be *from within*. Now the great salvation which the Gospel teaches us to seek is assuredly not *from within?*

Dr.—Pardon me, my dear sir. Again you take hold of a mere verbal difference; of course, the procuring cause of that salvation is not from within, any more than the agents—food, water, air, electricity—appointed to be maintainers of vitality are from within. But the *powers that appropriate* the salvation in the one case, or the external vivifying agencies in the other, is an inner power. Food will do no good unless it be eaten by our voluntary act, and digested; nor will the circumambient air vivify our blood, if we bar its entrance into the lungs, or if it finds them hepatised; so neither will the Divine teaching and atonement be of efficacy to save any man who does not grasp it *from within*—from his heart of hearts. The faith that bringeth salvation is the forth-putting of the inner man.

P.—I see that we are quite agreed. I mistook you. Your argument tends more and more to establish the proposition that the

innate powers of the animal constitution are all in all in the process of healing.

Dr.—Yes, it is for the organism alone to redress its own disordered actions, and with as little meddlesome interference of man as possible, which is too often *mischievous interference*, save to afford nature the best conditions, and the best materials, for doing her work.

P.—*The best conditions and materials for doing her work!* That is just the question at issue.

Dr.—Just. Common sense will judge between the drug-doctor and the water-doctor here. Take, for example, chronic disease of the stomach and liver, &c., treated in town by the one, and in the country by the other. Here we have on the one hand heaven's pure air debarred, by the patient's confinement in a close room, and in a close street, of a great smoky crowded city; we have, perhaps, leechings occasionally, and other reductive means—aperients, alteratives, anodynes, and demulcents—forming the excuse for a daily raking of an intestinal canal already in a highly morbid condition. But how does the water-doctor proceed to deal with such a case at his mountain home? First, the intestinal irritation is appeased by daily fomentations and the blandest diet, with an entire withdrawal of gratuitous irritants in the shape of drugs. The tone of the stomach is thus restored, and the strength daily improves. In proportion to the progress of the case, the skin is actively excited, by appropriate water processes, as having internal sympathies with the interior viscera. Pure air is breathed. Exercise, according to the strength, is indulged in. The mind is soothed by the quiet loveliness of external nature, and everything inspires hope.

The closest observance of the laws of Physiology, which the circumstances of the patient, and the nature of the malady, permit, is the only feasible common sense measure for the correction of those evils which their breach has entailed. This, I repeat, is the sole philosophic foundation for a true remedial agency—for a satisfactory, safe, and effective curative art.

P.—I am quite satisfied with the way you have made it out. As evil is good *aberrated*, or the downward or backward course, so the return to good by the upward direct course of the same path that led *from* it, is the CURE.

Dr.—Pardon me for again reiterating, *there is no other remedial principle in Nature.* My repetitions are only the more deeply to

imprint vital truths on your mind till you are thoroughly familiarised to them. We shall illustrate all these truths when we come to treat of the cure of diseases.

P.—Thus you have dealt fairly, I think, with the long popular idea—and an article of professional orthodoxy as well—of a *specific curative virtue* in medicines! But I believe medical men of science do not allege that drugs cure, but that they gain a position and time for Nature to right herself?

Dr.—Of course there must be a theory to justify the use of drugs. Such is the theory; but it is extremely vague and indefinite, and it leads to practice that is often extremely injurious. The gaining of time is so often only postponing the *evil day*, with a heavy interest on the debt when payable. In the majority of cases Nature would right herself in spite of such aid, and would right herself better and sooner for want of it. *The good that drugs have effected is as nothing compared with the evil.* The admissions of the greatest physicians are to this effect. The *use* and *abuse* are separated by a line so obscure, and so difficult to mark or recognise, that their distinction is sometimes impossible. Drugs are sharp two-edged tools, which the most wary will use with great caution, and only on absolute compulsion. But, when I come to show up the *modus operandi* of the water processes, I will prove to you that we can supersede their action in the majority of cases. The most enlightened of the profession are, in fact, becoming ashamed of this doctrine of the alleged curative power of drugs, and are abandoning it as untenable, as unphilosophical dogma. Their simple, cautious prescriptions show this. But the masses still cling to it tenaciously. Faith in nostrums does not receive the slightest countenance from science or from common sense. So subverted is this faith by every day's increasing experience, that the best practitioners, as they grow old, and become calm in judgment, usually end by the abjuration of faith altogether in physic. Witness the dying testimonies of Radcliffe, Boerhaave, Dumoulin, Baillie, James Johnson, and others.

P.—Did they see or announce the *reason* why physic could not cure?

Dr.—No. They did not perceive the *principle* of the failure. No drugs that they knew—however highly vaunted, patronised, and believed in—really possessed, according to their experience, the virtues ascribed to them. But they expected new remedies of

the same sort would be discovered! In this they erred. They saw not that *it was contrary to the grand remedial law of Nature —to the true philosophy of cure*—to expect help for the disordered body in any agencies but the powers of that body itself, liberated from disentanglements, from the operation of all disturbing causes, and allowed free scope, placed in the most *favourable conditions*, and supplied with the *best materials* for their work of self-rectification, of self repair.

P.—To the "Water-doctor," then, must belong the credit of having first given the reason of the insuccess of drug-medication—its natural, inherent, and necessary insuccess; and of having destroyed all possibility of future faith in such extrinsic, alien, and bootless resources, *by any one who shall henceforth master the philosophic bearings of the question.* This is to have done something to establish the peculiar pretensions of Hydropathy.

Dr.—I hope so. Fix this principle in your heart of hearts, *that it is contrary to the nature of things, to the laws of the Creator, to the constitution of the animal economy, that medicines should have transferred to them that power, which the living organism never delegates!*

Faith in the exclusive efficacy of the powers of Nature in the cure of disease, is the cardinal article of the "Water-doctor's" creed. And we believe that it is only now, for the first time, that the question has been put on its proper footing, argued on the only true grounds. The natural Law of Remedy (*help from within*) which we have feebly essayed to develope and expound—albeit tacitly acted on by all mankind in all other matters—has never before been definitely applied in theory to settle the vexed question of disease and remedy. Never before has it been perceived, or adduced, as lending the best sanction to those great water-cure principles of treatment, not new indeed, but which are there confessedly carried out, with a system never before attempted, with an efficacy never before paralleled.

P.—So that all the credit you claim for yourself, is to have been the first to perceive and insist on the best, the only valid, defence in theory, of what you have so much a right to boast of in practice? In other words, you affirm that the hydropathic treatment is more successful in its results than any other mode of *cure, because it is at once more conformable to Nature, and to the dictates of the abstract Philosophy of Remedy.* This I grant you; and this is no small praise, no small recommendation.

DR.—I shall calmly wait the verdict of the philosophic, of the public, and of the profession, whether the grounds on which I contend for the all-sufficiency of the innate curative powers of the living organism, can be invalidated. Those grounds prove to a demonstration, that mankind—professional and non-professional—in cherishing their favourite idea of SPECIFICS, have been lured to follow the *ignis fatuus* of a false philosophy, of a false art; doomed to the fate of being either lost on the barren heath, or sunk in its fatal quagmires!

P.—I freely admit that you have the strongest sanctions of philosophy and of fact, on your side, in repudiating faith in drugs as inherently-curative agents. It is evidently untenable in *principle*. But in *practice*—there's the difficulty. Have not the advocates of medicines, *facts*, too, on their side, if they want a justificatory philosophy for their use? Have not drugs often effected the cure of disease? Clear me this objection.

DR.—To affirm the cure of any disease by any drugs or complication of drugs, is so difficult as almost to amount to an impossibility. It does not follow that because a patient gets well after taking certain doses of physic, that *they* have effected the cure. Antecedence and consequence do not always stand in the relation of cause and effect. *Post hoc* is not necessarily *propter hoc*. But even admitting a temporary and partial benefit in some cases, as when calomel succeeds in disgorging a loaded liver; colocynth in moving torpid bowels; bark or arsenic, or a glass of brandy in relieving a fit of ague; opium the twinges of colic or neuralgia; colchicum in producing a deposit of uric acid, and relieving gout; the lancet or the leech in depleting the loaded vessels of an apoplectic brain. *Cui bono* after all? What is gained? Certainly *symptoms* in the cases alleged are sometimes *relieved*—the effects of deranged functions are *palliated*—but are we one step advanced in the route of RADICAL CURE; nay, rather, have we not retrograded? Are not the symptoms more confirmed? In a rare case occasionally, there is a real curative advance, I will admit. But it is only very occasionally, perhaps not once in a thousand administrations of drugs. Such I believe most conscientiously, and this after many years devoted to drug medication. In the infinite majority of cases the *fons mali*, the *cause* of the disturbed functions, remains unchecked, if not aggravated. The drug-relief is usually a simple *postponement of mischief*. It is only a question of time gained, perhaps for fresh indiscretions

with a body more and more disabled, in its curative energies, with each fresh dose of the temporary palliative. Time after time we witness fresh explosions of the same symptoms from the re-accumulation of morbid materials. For example, in the cases quoted, the *liver* again fills, the *bowels* get more obstructed, *colic* or *tic* returns after the opiates, *uric acid* becomes again predominant in the system, after the colchicum every fresh attack of *gout* is the severest, and the *apoplectic vessels* fill again after depletion. The ague fit is certainly the single prize among ten thousand blanks! although even quinine *often fails*, and therefore is not a *specific*, properly so called. And this is the only instance approaching to a specific that the millions of drug experiments, performed in every age, for three thousand years, have hit upon. But in nearly all these cases the relief is too dearly bought. The vital centres and their dependencies are weakened, and the *real disease intensified.*

P.—You contend, then, that drugging, *at the best*, is but the *medication of symptoms* generally to the aggravation of the internal condition of disease. If we are to go to the theoretical causes of the evil in any of these cases, then we must call into vigorous play the organic powers, to rectify those causes, to amend their own deranged action, *i. e.*, as you have shown, by placing each organ in the most favourable circumstances for its effective play, giving the stomach the best chance to make healthy blood materials, the lungs the freest scope to purify that blood, and the great animal safety-valves (the *bowels*, *kidneys*, and *skin*) full play to rid the body of superfluous matters, and for the nervous system *repose;* because it is the centre of sympathies, the source of healthy feelings. *But the relief of symptoms, at the expense of injury to the vital powers, I do not call a curative proceeding.*

Dr.—You are a very apt scholar in the Hydropathic school. I am delighted to see you profit so much by indoctrination, and that you now fully comprehend the bearings of the subject.

P.—The final question then remains, but that is one of practice, and I will wait further on in our conversations for its elucidation. I allude to the best mode of developing the powers of the system.

Dr.—The *practice* of that you shall see. *Theoretically* you have already answered the question to yourself.

The whole tenor of my remarks, and of your conclusions from them is to the effect that the kind of aid nature needs, is the way to develope and direct the vital powers, that they may rectify their own derangements.

1st. To remove causes, *i. e.*, the obstructions that embarrass her path. Here the CAUSES of disease must be minutely investigated, and everything in the habits or condition of the patient removed, that would tend to injure Nature's efforts.

2nd. To place each again in the circumstances most conducive to the perfect play of its functions, and especially to bestow double care on the chiefly affected organs.

We cannot take down the several pieces and compartments of the animal mechanism, as a watch or engine is taken down to be cleaned and repaired, and then to reconstruct the whole. This is not necessary with the living machine *which has an innate power of self-repair and self-cleansing implanted by the Creator, as part of its original constitution.* The whole art of healing consists, in eliciting this power of self-repair and self-cleansing. Man's province in this art is simply to superintend the conservative operations of Nature, to act as the engineer and stoker of the human engine—keeping it *on the right line,* and supplying the proper quantity and quality of materials to work withal—opening the proper conduits and safety-valves, when exterior arrests or internal obstructions occur.

But the great business and duty of the physician in reference to the sick will be expounded, with all fulness of detail, when we come to discuss the treatment of disease. Excuse the length of this conversation to-day. It was necessary to understand each other at the beginning, and to lay a foundation for the superstructure that is to rise. The interest of the subject will doubtless compensate the call on your attention it has exacted. At all events, the sound views it has developed will probably save you many days of sickness and sorrow. May they at least act as an incentive, to prosecute your further researches in a field of knowledge interesting for its own sake, but whose chief value is the rich harvest of sanitary counsels and precautions it yields, to every one who diligently cultivates it!

(*End of Introduction.*)

PART SECOND.

LIFE AND ORGANISATION.

CONVERSATION EIGHTH.

Life and organisation—Life, like matter, only known by its properties—Our ignorance of the intimate nature and essence of things—The business of Philosophy to investigate the conditions of the action of things—Life the sum of the phenomena of organised beings—How life is a forced *state—War of vital structures with the elements—Fallacy of the theory which makes life an entity—Why not chemical and mechanical substantive principles, or entities, to explain chemical and mechanical phenomena—The charge of materialism unfounded—The living principle of the human body and its immortal soul not identical—The latter a doctrine of Revelation—The full belief of this doctrine compatible with the repudiation of an abstract vital principle.*

PATIENT.—I AM now anxious to hear you begin to expound to me, as clearly as possible, the interesting questions belonging to the mysterious domain of life and organisation.

DOCTOR.—I shall gladly impart, as freely as I can, the opinions I have formed, after above twenty-five years devoted, more or less, to such investigations. On these perplexed subjects very erroneous views are popularly held. But to begin. As we know of MATTER only by its *properties*, its modes of being or acting, so we know of LIFE only by its properties, *i. e., the phenomena it manifests when acted on by certain stimuli.* The effects of *chemical* action are not more dissimilar from those of *mechanical* action, than are those of *vital action* from either of the former. Of the immediate or intimate nature of chemical or mechanical action, we know as little as we do of that of vital action.

P.—This begins already to melt away a little of the mystery connected with the subject of life. You argue that we know things only by their properties; the substratum or connecting-bond that holds those properties together we do not know. What

do I know of the *pen* that I take up from this table, but its colour, shape, size, weight, elasticity, hardness, or density, the roundness of its barrel, the sharpness of its point, the arrangement of its feathers? Take these *properties* away, and what do I know of its *nature* or *essence?* What care I?

Dr.—The *properties* of things, then, are all that the human senses can discern in this world. What do we know of these wondrous breathing-frames of ours, but that they possess, in addition to the common *physical* properties of matter, certain *vital* properties—a new class entirely—a class exclusively appertaining to animated beings, having no analogues in inorganic nature. All we can ascertain, all that it behoves the philosopher and the physician to investigate *are the conditions under which the several phenomena in question show themselves. The vital susceptibility, or endowment of organised structures, only shows itself, when these structures are exposed to the agency of peculiar powers* (*stimuli*). In that case, *the phenomena of life*, are called forth. An organised body, then, is that which possesses a property, in consequence of which, appropriate stimuli excite that series of actions, to which the term VITAL has been given. For example: atmospheric air is one of the essential stimuli of life; withdraw that for but a few minutes from a man, and all phenomena of life will soon cease to show themselves.

P.—How would you define life, then?

Dr.—*To define life is to recapitulate that whole series of actions produced in living beings by a system of organs acting to determinate ends.* We can have no idea of life apart from the *working* of living organs or apparatus.

P.—Life, then, consists in, or is indicated by, the active phenomena of organised beings. In this view *life* is not a *cause* of vital action, but is one and identical with it—*is that action itself?*

Dr.—Yes; but it is something more than the mutual actions and reactions of one part of the body upon another; otherwise a going watch, or steam-engine, or wind-mill, or water-wheel, might be said to have life. LIFE, in strict philosophy, is a mere abstract term used to denote *the sum or series of the vital phenomena, or characteristic actions, of organised beings.*

P.—These actions ceasing, the moving-power being destroyed, the mechanism shattered, *life*, in legal phrase, *non est inventus*, is nowhere. In the same way, derange the structure of your Æolian harp, and the wind blows throw it without eliciting its

music, *its life, to speak metaphorically, is gone;* that life, that music, lay in a certain arrangement of parts acted on by the vibrations of the breeze. The *sonoriety* of the wood and cords of the instrument was its *property*, which required the concurrence of two causes to elicit it, viz., a specific disposition of their parts, and the contact of an external agent, the wind.

Dr.—Your illustration is apposite; and makes it clear by that very analogy, that the cause of vital action lies in the *concurrence and co-operation of certain properties attached to certain forms of matter, with certain stimuli, which acting upon them, evoke those properties.* The *vital* properties of an organised *structure* or *organism*, infinitely transcend the mere *physical* or *chemical* properties belonging to *inert matter.* The latter are therefore, resisted, overpowered, suspended, during the continuance of life. *Life* has in this view been aptly termed *a forced state*, because it is the continued successful opposition of organised bodies to the decomposing tendencies of inorganic affinities, chemical agents, and the physical laws of Nature in general. Hence the ceaseless expenditure of vital power in this struggle, the inroads made on the vital organism by the wear and tear of the prolonged conflict, and ultimately *its subjugation* by those affinities, agents, and laws. With this is involved the destruction of organic arrangements; the total and intimate disintegration and disseverment of its particles; their return to the primitive forms of inert (inorganic) matter; in other words, *death!*—Your Æolian harp is shivered, the breeze blows through its wreck in vain.

P.—This eternal fight, then, of structure with element, is the reason why organised bodies are less durable, even the longest lived of them, than inorganic bodies, the oak than the rock?

Dr.—Undoubtedly. You see, then, from the above, how gratuitous, how fallacious is the theory which makes LIFE an assumed entity, a substantial principle, a sensible, intelligent, controlling power, being, or cause, entering into, and presiding over, material forms, regulating the processes by which the structure of organised beings is developed and sustained,—a PRESENCE, *awful, invisible, mysterious, sitting behind the scenes,* pulling the cords, (as it were) and working the movements of the *organic puppets;* and by a species of wizard art, dazzling us with phenomena—*the functions of structure*—to all appearances utterly incommensurate with the feeble agency used thereto. *Life*, I say, in such a sense, and as such a *thing* (material or immaterial), is untenable, is a

fiction! *Life* is not matter, nor an immaterial substance attached to matter, no more than music is matter, than words are matter, or immaterial substances attached to matter. We have no evidence of the existence of such an entity. There is no likelihood of its existence; analogy is all against it; such a tenet is alike contrary to sound sense, sound science, and sound philosophy. Neither does Scripture say aught contradictory to this view. *Life is a simple condition of being; a wonderful property attached by the Creator to certain specific forms of matter, or organised bodies; and in consequence of which they perpetually repair their waste, or reproduce the constituent particles of their mass in whole, or in part.*

P.—*So* it has pleased the Creator to constitute things, *so* to endow them.

Dr.—So!—As to the doctrine of the SOUL, and of its immortality, these are matters of Revelation, and are evidently beyond the scope of these conversations, which are exclusively confined to matters of science.

P.—But are not these views cavilled at?

Dr.—Of course. Prejudice will cavil at anything.

P.—The imaginary vital principle or entity of some writers, then, is, a mere mental abstraction personified—the floating phantom of an erring fancy—an IDEA caught, embodied, and clothed!

Dr.—Yes; this substantive idea of life is a simple *metaphysical conception*, which, banished from the domain of astronomy and physics, now only lingers among the mysteries of chemistry and physiology. If an *entity* or *substantive principle* be necessary to account for one set of phenomena, why not for all? If for vital, why not for chemical and mechanical phenomena? To ascribe the phenomena in question to a chemical or mechanical *principle* does not bring us one whit nearer their true nature; wax is plastic, wood is combustible, the magnet is attractive, caoutchouc is elastic, bird-lime is adhesive, vitrol is caustic, gunpowder is explosive, &c., &c. But if we ventured to attribute these properties of bodies to a *plastic, combustible, attractive, elastic, adhesive, caustic*, or *explosive* PRINCIPLE or *entity*, we should rightly subject ourselves to ridicule. So it is with VITAL PROPERTIES.

P.—All that can be said, then, is this, that the phenomena exhibited by organised bodies, under certain conditions, show that they are endowed with those properties to which the term vital has been given. There the matter ends. You have now convinced me that to invoke a vital principle, to explain vital phenomena,

and yet to repudiate a chemical principle, to explain chemical phenomena, or a physical principle to explain physical phenomena, are anomalies in philosophy, and in fact inversions of common sense, contradictions that show how little still the "schoolmaster is abroad!"

DR.—You see the subject in the right point of view. The ancients had no idea of the essentially different properties,—resulting from differences in the elementary particles, arrangement, and structure of different forms of matter. They held all matter to be essentially *inert;* and, of course, all spontaneous or automatic movements in matter, *i. e.*, the peculiar chain of actions distinguishing organised from unorganised substances—were naturally attributed to a *substantial* moving cause, a secret, hidden, mysterious principle or entity operating within them. Hence the error has been propagated from age to age, from sect of philosophy to sect of philosophy, material and mental. It was to have been hoped, that the progress of science, would have cleared away the vague notions of LIFE and LIVING ACTIONS, as the result of a palpable LIVING PRINCIPLE. Yet this doctrine, unadulterated, unmitigated, unmodified, even now dare hardly be questioned,—without raising against us the cry of heterodoxy!

P.—And what is worse, will not some charge you with materialism?

DR.—They may. But *the charge is false;* and only shallow thinkers, or bigots who never think at all, will prefer it.

If the alleged *living principle of the body*, and an IMMORTAL SOUL, were identical, then all living beings have immortality! That the latter is a Divine gift to man is a point of explicit revelation. Before that we bow. As regards that best of all knowledge, which was too high for our frail natural capacities to reach, the infinite God, in infinite mercy, *came down* to the point to which we could not *come up*. That beneficence which we see so profusely scattered over all the works of the Creator, would lead us to expect an act of condescension and compassion of that sort. Questions of faith and morality may be corroborated, but can never be invalidated by physical philosophy!

P.—I think with you. The deductions of sound philosophy can never be *really* opposed to the persuasions of right reason, or the doctrines of *true* religion!

DR.—The repudiation of an abstract VITAL PRINCIPLE, is quite compatible with full belief in the divine declaration of the immor-

tality of the soul. If our opponents be right, dogs or elephants must have high warranty for immortal souls, and immortal destinies, because they possess not merely common life, but high intellectual faculties and passions—attention, abstraction, imagination, judgment, remembrance, joy, and grief. That a soul and its immortality are man's high prerogatives, is an assured conviction resting on the most solid basis—the authority of Holy Writ! Faith in the Word of Inspiration *must* supersede every other evidence on such a point.

CONVERSATION NINTH.

Vital action of the SECONDARY CAUSES *of the Creator—Organised structures, like others, undeviatingly obey the laws of their action—Distinction between life and vitality—Relation of organisation to life—Causes of organisation—Origin of organised beings—What is implied by death—To what the increasing fragility of organised beings in old age is attributable.*

DOCTOR.—VITAL action, like chemical action and mechanical action, is one of those *secondary causes*,—which the GREAT FIRST CAUSE of all things works out his designs; adapting, with consummate skill, specific means to determined ends. To subserve the innumerable purposes desired by the actions called *vital*—to carry on certain chemical and mechanical processes, and to resist others—to lay down new matter, and to convey away old—to select, prepare, mould, and fashion the food to innumerable corporeal forms—to repair injuries, and to counteract diseases—to keep the heart, lungs, blood-vessels, brain, senses, nerves, glands and bowels in perpetual activity, is not the office of an Anima or Archeus—an all-present, all-sufficient, all-intelligent PRINCIPLE, or presiding genius of the economy. No! These complex ends imply the existence, and necessitate the operations of a host of textures, and forces, and organs—*all irrational, all unconscious in themselves, but each undeviatingly obeying the laws, and blindly fulfilling the purposes imposed upon them in the beginning by an Omnipotent and Omniscient Creator.* Thus every

part of the living organism works by itself, and all the parts work harmoniously in combination, to effect the ends they were intended and fitted to accomplish.

This much we will concede, that the operations of the vital properties of organized beings *resemble, in many points, those of reason, for they work according to a definite rational plan;* creating individual parts, having relations of fitness and harmony with the design of the whole—bringing it about that each separate part, each pulley, wheel, and lever of a complex vital mechanism keeps in its place, exactly fits in its place, and does the work of its place; at the same time consenting in its action with the whole, and answering to the ends of the whole. And so close is this alliance and dependence of parts, that if any jar or disturbance, how slight soever, occurs in any part of the organized structure, the whole sympathises more or less with it, or is affected proportionably.

PATIENT.—The sum of your observations, then, is to this effect, viz., that the active operations of organised structures, although in accordance with design, obey a blind necessity, or undeviating laws of adaptation and action, and all without consciousness.

DR.—Yes! and it is in consequence of these undeviating laws of operation, that the plastic matter from without is modified, and appropriated to organised tissues, that the animal body is preserved, its daily wasting structure repaired, its daily exhausting endowments replenished, and its diseases cured.

INSTINCT may be quoted as an illustration of vital properties acting in accordance with design, but without consciousness. Cuvier said very beautifully, that animals acting from instinct were possessed, as it were, with an innate idea, *or by a dream.* They act blindly and unconsciously, but according to laws of adaptation.

P.—What distinction do you draw between LIFE and VITALITY?

DR.—The latter is the quiescent or passive state, and is illustrated in the seeds of plants before germination, and in the impregnated germ of the egg before incubation. Life is the property of a being in action; vitality is the condition of the structure fitting it to evince that property in the application of the requisite stimuli—the concurrence of the requisite conditions, as warmth, air, nutriment, and water. A seed may lie for a thousand years buried deep in the soil, or with a man's ashes in his tomb. All this time it has retained its *vitality*, or capability of living, but it has not given evidence of life, living action. It has been dormant.

It has retained the power only of being acted upon. If the structure of the seed had been crushed vitality would have been destroyed with it; no stimulus would have roused vital phenomena. The first condition of vital action, then, is the maintenance of a specific organic constitution. This is vitality. The seed only awaits the concurrence of the second condition of vital action, viz., *appropriate stimuli*, to rouse its latent vitality. It only needs to be exposed to the genial influences of heat, moisture, soil and atmosphere, to grow into a plant—to bud, flower, and fructify.

These stimuli, or sustainers of vitality, afford both the impulse to change, and the materials of change, in the particles of the living body. By their continual influx and replenishment they maintain that essential elementary combination of the fluids and solids, which is the necessary condition of those organic changes in which the actions of life consist. This interchange of matter, this extruding of the old or worn out components of animal bodies, to make room for the deposit of the new, is great and rapid, in proportion to the activity of their locomotive and voluntary powers.

P.—I believe life has been compared to the phenomena of combustion and flame!

Dr.—Yes! and not inaptly. The atmospheric oxygen unites with the burning body. Heat is developed by the combination and decomposition thereby taking place. The phenomena of fire continue, so long as oxygen and combustible materials are supplied. This is not life, but the nearest likeness to it. The vital stimuli represent the oxygen and combustible matter. The body is the furnace.

The grand and all-important practical questions connected with these vivifying stimuli, food, air, water, warmth, we shall subsequently discuss with full detail in their appropriate places.

P.—What is the relation of *organisation* to *life?*

Dr.—Life is an effect of organisation. You see this in the primordial CELL, the type of vital action. It retains the power of infinitely reproducing itself, putting forth the elements of endless forms of structure, each charged with *life*. Destroy the peculiar organisation of the living cell—crush it—and its life ceases. So that life is referrible to organisation.

P.—If so, what is the *cause* of organisation?

Dr.—No mere chemical or mechanical forces, simply or combined, are competent to bring into existence a determinate organic structure. The peculiar combinations, arrangements, and affinities

by which inorganic are transformed into organic elements, can only be effected by the vital forces of living organs. So, to originate the organised being, requires different laws, processes, and properties, from those which regulate the formation of inorganic matter. In short, organised beings can only be formed by such as are already organised. The embryo pre-supposes the parent. The organisation of an embryo, endowed with the properties of the parent—and thereby the constant renewal of the fabric in new moulds, the young—is the result of a process of secretion. The function of secretion, as we shall see, *consists in the depositing, or throwing off, of vital cells.* The same law, and almost the same forces, which capacitate organised beings to renew their tissues incessantly, according as they are wasted (removed by absorption), fit them to deposit new products, to develope new growths—the germs or rudiments of new beings. It is the property of this *germ*, to be able to commence and continue a series of vital actions, which only demand the co-operation of certain natural stimuli, to result in structure in all points like that of the parents. For convenience, this process is called the *vis formativa,* or plastic force. From the germinal membrane, bit by bit grow in a definite series, or progression, the various tissues and organs of the body;—*the first germs being the product of mature and perfect beings of their kind.*

P.—The vital properties, then, or the organising force seem to flow, as in a stream, from the producing parts into the young living products—those ever newly produced—so that while the individual perishes, the race is virtually immortal.

Dr.—True. This forming, and throwing off, from themselves of the germs of new beings—each after its own kind, in properties and endowments—is one of the distinctive attributes, and characteristic actions, of living beings, plants, and animals.

P.—But in tracing back the *origin* of the several kinds of organised beings, the question again returns upon us—*what is the cause of organisation?* How was the first parent of every species formed?

Dr.—We cannot speculate on the origin of living beings, any more than on the nature of organic forces, or living properties. These things, no philosophy, no physiology, no analogy, can teach us. All we can say is, that the various tribes of organised existences were called into being *at the beginning* by the FIAT of SUPREME WISDOM and ALL-CREATIVE POWER. From this starting-

point, each was constituted to reproduce its kind. Hence their constant succession downwards in the course of time, till the same ALMIGHTY FIAT shall recal the power, or annul the law!

P.—What is implied by DEATH? I speak not of course, of its theological aspects, but as a pure physiological act or fact.

DR.—Not the abstraction of a substantial vital principle (which no where exists), *but a cessation of the necessary conditions of life.* First, of the requisite organic constitution; and second, of the appropriate stimuli to act thereon. The failure, in short, of the elements of motion for each and every part of the organism. The stand-still state of death, as contrasted with the active movements of living beings, no doubt suggested the notion of the loss of a distinct substance, or *living, moving principle,* as the CAUSE of motion. But these movements analysed, are found to be partly chemical, partly mechanical, and partly the result of peculiar properties of the tissues called VITAL. The mutual co-operation of all those powers, brings about those actions in which life consists.

P.—To what is the increasing fragility of organised bodies in old age attributable?

DR.—Probably to the increasing accumulation of the products of decomposition, and the interchange of new matter being proportionably slow and defective. The effect of this, is, that the excretory organs—the safety-valves of the body—gradually get clogged; *i. e.*, the chemical affinities of organised matter, instead of being—as in the morning and mid-day of life—in perfect subjection to the vital forces, come first to balance them, and then to be in the ascendant. This result will take place sooner or later, according as the irritability of the structure has been more or less prematurely drained, by *fast living.* But this is anticipating. These practical discussions will be taken up at a later period of our conversations, once you have been indoctrinated into the general principles, which after this I shall proceed to discuss systematically, and with as full detail as my time and limits will allow.

PHYSIOLOGY.

CONVERSATION TENTH.

Preliminaries to the unfolding of the symptoms, course, causes, and cure of diseases—First principles of physiology—Organic and inorganic matter—Phenomena, forces, or properties of bodies—Vital properties—Vital stimuli—Inherent difficulty of the study of vital phenomena—Motion, perpetual, physical, or chemical change—The primal law of nature—Illustrated in the molecular changes of living bodies—Animal processes a ceaseless round of reproduction and decay—Character of organisms determined by the mode in which they are constituted to be nourished—The anatomy and physiology of the higher animals exhibited in a series of deductions from the laws of repair and waste, i. *skeleton,* ii. *cerebral, spinal, and ganglionic nervous centres,* iii. *circulating apparatus,* iv. *digestive apparatus,* v. *respiratory system,* vi. *assimilation, secretory, or vital-elaborating apparatus,* vii. *capillary and venous,* viii. *excretory or glandular apparatus,* ix. *reproductive apparatus,* x. *organs of relation,* xi. *organs of mind.*

PATIENT.—IT has always been an anxious desire with me to understand clearly the difficult subject of the diseases of the human body.

DOCTOR.—In order to comprehend the symptoms and the course of human diseases, their causes, and their cure, you must first understand the functions of the body in health, the properties and laws of life, and at least so much of the *generalities* of anatomy as are necessary to unfold the mechanism by which these functions are performed, and through which these properties and laws take effect. And because our task compels us to look at man chiefly in his material aspects, do not therefore suppose that we deny to him aught of his high prerogatives, his high aspirations, his high destinies.

P.—Your silence on what does not strictly concern your province—except indirectly and incidentally—will not be construed uncharitably. It clearly belongs to other teachers to discuss man as an intellectual, moral, and religious being.

DR.—Man's physical constitution is the basis and substratum on which all his other high attributes are laid. The latter are infinitely modified by the varying conditions of the health of the

former. To understand, then, the reciprocal dependencies and relations of mind and body, and how they are influenced by material and psychical agents in the world without, we must study the laws, structure, and operations of the human mechanism in health (*physiology*), and its deviations in disease, its functional disturbances, and organic alterations (*pathology*).

P.—Well. Begin at the beginning, if you please, for I am desirous of laying a broad and deep foundation on these deeply interesting, and practically useful, sciences.

Dr.—All matter is divided into the two grand classes of ORGANIC and INORGANIC. The solid globe we tread on is the inorganic matter: but the beings that people its surface, whether in earth, air, or ocean—and the vegetable products that clothe it with beauty and primarily impart sustenance for all—are instances of organised matter. All bodies have certain properties in common, as bulk, weight, form, colour, &c. The distinguishing characteristic of organised bodies, however, is, that they possess an elaborate mechanism, displaying such design, executing such results, and holding such dependencies among themselves, and such relations to the earth whence they spring and are nourished, as only a SUPREME BEING, all-wise, all-powerful, all-benevolent, could devise, establish, and sustain.

P.—How do you classify the phenomena, forces, or properties, which belong to the different forms of matter?

Dr.—They reduce themselves to three great classes. First, PHYSICAL, or MECHANICAL; second, CHEMICAL; third, VITAL. Each of these is totally diverse from the others in character, conditions, and operations; and is alike inimitable and unsubstitutable the one by the other. The first of these forces—the *physical*—is in operation at all times and under all circumstances. The second class—the *chemical*—only operates under certain given conditions of one particle with another. The third class—the *vital* forces or properties—is shown only in peculiar forms of matter and in obedience to certain *stimuli* (exterior or interior agencies, as food, air, heat) which provoke their actions.

P.—You have said that we know nothing of *the ultimate nature* of physical, chemical, or vital causes.

Dr.—We have not faculties to discern the ultimate nature of anything. We only take cognizance of matter *by its properties*, sensible and visible; and we recognise these properties only by their effects. A *property*, as applied to an organised being, may

be defined to be, a particular susceptibility attaching to that being or a capability of taking on certain actions, which it assumes only on the application of appropriate stimuli; *i. e.*, under certain conditions, or fitting circumstances. Thus the sensitive plant evinces the property of contraction on touching it. Contractibility is also a property of muscular fibre, which is called forth by certain stimuli, as the motions of the stomach by the presence of food, of the bladder by the distension of the urine; those of the heart and arteries, by the quantity and quality of the blood; the voluntary muscles are excited by the stimulus of the will (*pure innervation*).

P.—In the same way you would say that combustibility, or the capability of burning, is a *property* of wood, coals, wax, tallow, oils, spirits, resins, &c.

Dr.—Yes; only it requires a peculiar combination of circumstances, or conditions, in order to develope this property in these substances.

P.—A force, power, or property is, therefore, distinct from the action which it produces.

Dr.—Clearly. What *gravitation* is, as a simple force, we know not. What it is *to be attracted*, we do know.

P.—I suppose the same argument applies to LIFE. What VITALITY is, as a simple power or property, we do not know. What it is TO BE ALIVE—to exhibit living action—we do know.

Dr.—Unquestionably. The microscope has fortunately come to the elucidation of many of the difficult questions of physiology. By bringing into view the retired, remote, and otherwise viewless recesses of the organism, it has shown that what are termed *vital properties*, or the constitution and endowment of organised bodies, are dependent on certain modes of arrangement and combination of the elementary particles of matter. In order that vital phenomena show themselves normally, two great conditions must exist: 1st, a sound constitution of the structure or organism; 2nd, appropriate stimuli to act on it, and to call forth its powers. These stimuli may be comprised in temperature, heat, moisture, food, drink, volition, instinct, desire, passion, the contact of exciting substances.

P.—Up to this point everything is clear. Can you give this exposition, so far, a practical bearing on Pathology?

Dr.—Its application to disease is sufficiently clear. Diseases being *perverted vital manifestations*, *i. e.*, the deranged play of organs, or exercise of functions, the *causes* of such disordered

states reduce themselves (on ultimate analysis) to two simple classes, comprised in the failure of the conditions under which the normal properties of a structure, or the functions of an organ, come into play. These are, 1st, some (abnormal) change produced, or (some normal change) prevented in the ultimate tissues of an organ. The nutrition of these tissues, *i. e.*, the molecular change there taking place, is excessive, defective, or perverted; 2nd, the stimulus requisite to call forth, or keep up vital manifestations, is either excessive, defective, or unnatural.

P.—That is indeed a very comprehensive application of abstract physiologic truth. To revert to the ultimate material principles or particles of both organic and inorganic bodies, are they not composed of essentially the same elements?

Dr.—What the form, essence, or qualities of the primary molecules, or atoms of matter may be, we have not faculties for knowing, and it is certainly not the business of philosophy to determine. The peculiar character, forms, and properties of bodies depend on peculiarities of atomic or molecular arrangement, not on peculiarities of essence or nature. Each individual form of matter has its own peculiar laws, constitution, and properties, in consequence of specific differences in the arrangement of its ultimate particles; and it has, besides, definite, fixed, unalterable laws of relation with all other forms of matter. The chemical elements oxygen, hydrogen, nitrogen, carbon, with light, heat, electricity, and magnetism, *may* perhaps acknowledge one *basis*, element, or principle in common. Their diversities of properties may depend on the extent to which they are simple or compounded; *i. e.*, on the quantity of some second element added to the common basis. This at least is certain, that the peculiar aggregation and confirmation of their primary particles, constitute the palpable differences in the forms and qualities of material bodies.

P.—The great probability is, then, that the difference between brain and bone, nerve and naphtha, sand and salt, iron and indigo, muscle and mucus, tendon and tears, hair and horn, &c., is only *in the arrangement of the primordial atoms.*

Dr.—All analogy, the simplicity and uniformity of the means employed by the Creator to accomplish the most diverse and complicated ends, lead to the supposition of the *oneness* of the basis of all forms of matter.

P.—The *laws of life*, I presume, the same as the laws of physics

or chemistry, refer to the *conditions* under which their respective phenomena make themselves evident to our senses.

Dr.—Quite so.

P.—I presume, also, that the whole difficulty encompassing the study of vital phenomena arises from the highly complex nature of the living mechanism in the midst of which they originate.

Dr.—Yes. The excessive complexity of structure, and the difficulty, or rather the impossibility of isolating vital actions from the intimate mutual dependence of parts, vitiate all physiological *experimentation*, in the strict scientific sense. The entire, absolute and specific action of any agent is almost impossible to be determined. You cannot modify the condition of one organ of the body without modifying more or less every other. For a living being is a unity; *quoad* organisation, it knows no divisions or compartments; the series of organs is a circle without break, without beginning or end; among themselves there is no priority or inferiority. The organism is "one and indivisible." In experimentation on the living being, therefore, it is hard to say whether any given effect be due to primary or to secondary causes. Not so with experiments on inorganic bodies. Here it is in our power accurately to appreciate effects, because it is possible to eliminate all disturbances and conditions, all influences except the one sought. We can perfectly test, for example, the relative powers of two reaping machines, because we can measure accurately the amount of space allotted for the experiment, and the time taken. Besides this inherent difficulty in the way of physiological experimentation, we have to deal with organisms no two of which, even of the same family, are alike.

P.—I conceive it very possible that many of the changes occurring in organised beings are affected by the same chemical and physical forces as operate in the inorganic world.

Dr.—Undoubtedly. Others of the phenomena in question, however, are not so explicable. They are the result of *vital* properties, a class entirely diverse from physical or chemical properties.

P.—What would you say was the *primal law* of the material universe?

Dr.—Motion—perpetual physical or chemical change. This we find, alike in the busy chemistry of inorganic nature, as in the ceaseless operations of organised bodies. It is seen in the gradual wear and tear of all mundane things; in the revolutions of day

and night, in the phenomena of the seasons, in the rising and setting of the heavenly bodies; in the tides of ocean, and the flow of rivers; in cloud and rain, in vapour and dew, in lightning and thunder, in wind and tempest, in frost and snow; in the central fires of earth, and in the eternal smoke of the volcanic chimneys whence they find vent.

P.—You have said that in the organic kingdoms the same law holds equal sway.

Dr.—Yes. Here there is no permanence, no stand-still state, any more than in the inorganic world. The same restrictive force unceasingly operates the disintegrating changes that take place in living as in inert matter. *This is the law of decay or decomposition.* It consists in a perpetual molecular change of structure, or chemical alteration of the particles of which bodies are composed; in other words, *a tendency to separate into more simple combinations.*

P.—Are the changes that mark the decay of organic and inorganic matter, alike?

Dr.—No; there is this wide difference. *Interstitial changes,* or the disintegration of structure, operated *from within, outwards,* or *occurring through every part of its texture,* is the characteristic of the decay of organised matter; in inorganic matter, on the contrary, these changes are operated *from without inwards, i. e., on the surface.*

P.—What is the disintegration or consuming agent?

Dr.—The oxygen of the atmosphere; by its means iron rusts, rocks wear away, and the greatest works of man crumble into dust. In like manner, when the body pines and wastes away under the ravages of disease, or the deprivation of nourishment, it is the same *oxygen* that takes down, that literally *eats* or *burns* away the structures piecemeal.

P.—Will you illustrate more particularly, if you please, this *law of incessant change,* in the case of the functions of the animal body?

Dr.—The whole processes of animal life are one ceaseless round of reproduction and decay. Secretions are ever going on; oxygen is absorbed at each inspiration; water, carbonic acid, and the invisible halitus from the skin, are essentially given off. The out-putting of power, the movements of muscles, the discernments of the senses, even the manifestations of thought, will, emotion, &c., occur not without disintegration and waste of

matter. The radiation of the corporeal heat in air, and its evaporation in moisture, largely contribute to this waste. But the power of renewal is quite co-equal with the rapidity of waste. The structure is thus constantly changing itself, particle by particle, the old momentarily gives place to new matter, is absorbed, and removed. The new structural deposit in its turn having fulfilled the purposes of the economy, again comes under the power of inorganic affinities, is decomposed and eliminated.

P.—So that from time to time the whole organism is renewed?

Dr.—Completely so. *Blood* is the means by which the new materials are introduced, and the channel through which the old, decayed, and useless particles are let out. This effete animal structure, which has accomplished its ends in the economy, and is removed, is not, therefore wasted, or thereby lost. But being reduced again to its inorganic form, it is capable of contributing once more to the support of life—*the life of plants.*

The mode in which organised bodies are constituted by Divine Providence, to receive the supplies of matter needful for their development and maintenance, determines the character of their organisation. Vegetables are supported solely by the constituents of the soil, and air, and by water. Hence they only require a fixed locality to grow in, and roots, stems, leaves, &c. as the instruments of their nutrition. Animals, on the other hand, as possessing the power of locomotion, and requiring to go about in search of their food, possess receptacles for holding beyond the mere supply of the moment, and for digesting it. This necessitates the play of a much more elaborate mechanism. Hence the foundation of the grand characteristics of animals (especially of those of the higher classes), *their twofold vital systems*, and the organs subservient thereto. 1st. The system of individual and intrinsic life, that which concerns their automatic actions, or organic processes. 2nd. The system of extrinsic or related life, that whereby they are connected with the great world without, whence they are to draw the materials of their nourishment.

P.—It seems to me that *the law of recomposition*, or the inherent renewal of the particles of which organised bodies are composed, is only a modification or another expression of a law of mechanics, viz., *that all moving bodies, in order to the continuance of motion, require the repeated renewal of the moving power;* in other words, the replacement of new ingredients or elements of motion.

DR.—Precisely so; the animal body is no exception to this law. It needs the continual addition of new materials of motion.

P.—*Periodical winding-up*, as we should say, or ever and anon supplies of fresh fuel to keep alive the vital fires?

DR.—Yes, that is the idea. The whole complex apparatus of animals is constructed in reference to those two primary laws of organic change (those of repair and waste). In fact, from the provisions necessary to ensure the perfect operation of these fundamental laws, *may be deduced, in a beautiful chain of sequences, the whole structure and functions, the anatomy and physiology of the higher animals*, as follows:—

I. A solid framework of bones, THE SKELETON, a simple mechanical apparatus on which to hang, and within which to lodge the several pieces of animal mechanism, the muscles, nervous, circulating, and other systems—the levers, pulleys, wheels, pipes, conduits, reservoirs, boiler, furnace, flues, chimneys, down even to telegraphic wires of communication, signal posts, and central offices, by which behests are sent, and from which government emanates.

II. A prime moving-power, the CEREBRAL, SPINAL, and GANGLIONIC NERVOUS CENTRES, and the transmitters of this power, THE NERVOUS CHORDS, or nerves proper.

III. Organs taking every part of the ever-consuming living structure into direct relation with the elements of renewal; in other words, organs to distribute the materials necessary to replace its loss of heat, and to repair its wear and tear. Hence the existence of a CIRCULATING APPARATUS.

IV. Organs in which to receive and elaborate the occasional supplies of the materials of animal heat and nutrition. Hence the provision of A DIGESTIVE APPARATUS.

V. A furnace in which to prepare the fuel, and to receive the supports of combustion—pipes or flues through which to distribute the heat—chimneys whereby to liberate the smoke and ashes. Hence the necessity for A RESPIRATORY SYSTEM, and its adjuncts.

VI. Organs to overcome the inorganic affinities of the nutritious materials, and to convert them into living matter. Hence the necessity of an ASSIMILATIVE, SECRETORY, or VITAL-ELABORATING APPARATUS. This is the office of the Lacteal system, and, perhaps, to a certain extent, of the Lymphatic system.

VII. Organs to decompose, or take down, and take away, the structure where and when it has fulfilled the purposes of life, Hence the necessity for a CAPILLARY and VENOUS APPARATUS.

VIII. Organs to separate the products of decomposition; to admit the quiet exit out of the economy of the effete elements of food or structure. Hence the necessity for A GLANDULAR APPARATUS, or A SYSTEM OF EXCRETORIES, DRAINS, AND OUTLETS.

IX. Organs for the perpetuation of the species.

X. ORGANS OF RELATION, *i. e.*, to connect the animal with the world without, to search for, to seize, and appropriate the materials of its heat and nutrition. Hence the necessity for a sentient, nervous, and muscular system, respectively instruments of locomotion, of special senses, and of psychical acts.

XI. Organs, lastly, characterising exclusively the highest animal —man, endowing him with those *high attributes* by which he is to develope his divine nature, as a being made in God's image, and fitted by heaven for a great destiny.

P.—A fitting commentary on the words of our immortal bard,— "What a piece of workmanship is man? How noble in reason! how infinite in faculties! in form and moving, how express and admirable! in action, how like an angel! in apprehension, how like a God! the beauty of the world! the paragon of animals!"— (HAMLET.)

DR.—The conjoint work of this entire series of organs, each in its own department, within its own limits, and to its own ends, is the production of one grand result, viz., *the perfect functional operation, and corporeal purposes, of the animal organisation; and the consequent happiness and well-being—however perceived, however expressed—that accrues to every creature from fulfilling the laws of its constitution and the will of its Creator?*

CONVERSATION ELEVENTH.

Sketch of the general philosophy of the animal economy continued—Products of animal decomposition, carbonic acid and nitrogen; how eliminated—Digestion a simply chemical act—Vitalisation of chyle commences in the lacteals—The functions of the lymphatics.

PATIENT.—WILL you please continue your sketch of the general

philosophy of the animal economy? I am content in these more purely scientific details and generalisations to be a listener rather than an interlocutor.

DOCTOR.—Carbonic acid is the first product of the decay of all organised bodies. This poisonous gas is most largely evolved in the animal system. The decarbonising of the blood is so paramount an object that two special organs are set apart for it, viz., the *lungs* and *liver*, besides the skin to a certain extent, and a special heart is provided for propelling the blood through the lungs, *i. e.*, for bringing it into extensive contact with the atmospheric air, in order to replace its carbon by oxygen. There is this difference in the function of the liver, that the superfluous hydro-carbon of the system is not burnt off, but drawn off, in the shape of biliary secretion, which subserves the process of digestion.

P.—Are there any other products of decay, save carbon, thrown off from the animal system?

DR.—Animal substances in decomposing throw off NITROGEN as well as carbon. To eliminate nitrogenous decay of the system is of as essential importance to the due play of the functions as the extrication of the carbon. Its non-separation from the circulating fluid invariably causes death. The nitrogen goes off in two combinations—first, with carbon, forming *cyanogen*, and, secondly, in union with hydrogen, forming *ammonia*. These exhibit the benevolent provision for the comfort of the creature—ammonia being too offensive to be eliminated by the lungs. An excreting organ, supplementary to that of the lungs and liver, is necessary to separate these nitrogenous products of decay. This is presented in the *kidneys*. Their specific creation—UREA—is identical in chemical constitution with cyanate of ammonia.

The retention of the urinary fluid in a reservoir (the bladder) is not an essential element of the function, but is merely a convenient provision—I need hardly say how benevolent a one—for the exigences of animal existence.

P.—What have you to say of the generalities of the nutritive function?

DR.—*Digestion is a purely chemical act;* the gastric secretion is a chemical solvent. The elevated temperature, and the muscular movements of the organ, are joint accessories with it, in resolving the swallowed mass into chyme. This again is further elaborated in the next intestine, the *duodenum*, by the mixture of the biliary and pancreatic secretions. Unreduced and refractory

elements are made conformable or absorbable. The more residual (or excrementitious) portion is precipitated from the more nutritious chyle. The blood-vessels and absorbents of the intestinal walls (the lacteals), take up the nutritious portion as the mass is being propelled along, by the contractions of the alimentary tube. Finally, the unabsorbable *debris* of the food, with the excrementitious secretions of the liver and smaller glands, are voided by a reflex muscular exertion, under control, however, of the will.

P.—When is there reason to suppose that the nutritious fluid becomes vitalised?

Dr.—Not till it gets into the intestinal absorbents (the lacteals). Up to this period the changes are merely preparatory, simply of a physical or chemical nature. The lacteals do not absorb by patent mouths, as long supposed, *but by the growth of* CELLS. *These fill with the nutritious matter, break, and give up their contents to the lacteal absorbents. Cell-formation* has no analogy in any physical or chemical operation. *It is a purely vital process.* With this cell-development in the lacteals commences the first real vitalisation (or assimilation) of the nutriment. The chyle is still further elaborated (or organised), in passing through the innumerable *glands* that stud the lacteals.

P.—How intensely interesting are all the plans and operations of nature. To what do you attribute the propulsive power of the lacteals?

Dr.—Analogy impresses us with the conviction, that the propulsive power of the lacteals *is a pure reflex act*, the stimulus of their contents sufficing to call forth their contractions. Perhaps the vital actions going on in the lacteal glands have some share in determining the chylous current in them; in the same way as the cutaneous and pulmonary exhalations, are actively concerned in propelling the blood forward in its course.

In proportion as the nutrient current winds its way, through the tortuous glands and ducts of the lacteal system, the alteration in its properties becomes more and more decided. The cell-organisms seen commencing at the mouths of the lacteals, become more perfected, and the organisation of the fluid is more advanced. The microscopic appearance demonstrates this. It will be shown in its proper place, that all organisation, every vitalising process, *commences in cells. These absorb, elaborate, change, vitalise the nutritious fluids amid which they float.* When they have ac-

complished their function, their term of life, they burst or liquify. The chyle thus elaborated, thus vitalised, is conveyed into the blood-vessel system, and flows directly to the heart. Therein it joins the general circulating mass, and undergoes in its transit through the lungs, and by contact with the air, its further and final vivifying process. The blood discharges at this part its carbonic acid, the dead *debris* of the system, and receives in lieu OXYGEN—and in all probability, also, the atmospheric ELECTRICITY, a co-vivifier.

P.—Is the function of the absorbent apparatus to remove the effete of used-up materials of the body?

DR.—I do not believe so. The lymphatics, as well as the lacteals, are for the purposes of nutrition. The wasted and useless elements are separated from the body in various ways, and by various outlets. The excess of nutriment is laid aside in the shape of fat, or strained off in other ways. The veins are the chief carriers-off of the superfluous carbon. The nitrogen is eliminated by the kidneys; the superfluous water, and other elements, partly by the kidneys, partly by the skin. The immense glandular apparatus concealed in the coats of the intestines, are no doubt for the elimination of other animal products, whose retention is incompatible with health or life. I am quite clear that the function of the lymphatics, is subsidiary and supplemental to that of the lacteals. They make their course to the same points, and blend in the same channels. Their contents are the same in chemical constitution. The same knots of glands everywhere present along the junctions of their communicating lines. Of the decomposed tissues a part only is truly effete, and unfit for any nutritive purposes. Substances that may still be elaborated into nutritive materials, are (with nature's usual economy of her resources) taken up by the lymphatics—viz., such crude portions of the blood as may have transceded from the walls of the capillaries into the interstices of the areolar (or cellular) tissue.

CONVERSATION TWELFTH.

Of the elementary constituents of the human body—Cell-theory of structure—A nucleus or cell the type and starting-point of all organisation—Vegetable cells transform inorganic elements into organic compounds, the nutriment of animals—Growth or development of cells more or less persistent—Secretion a successive crop of evanescent cells—Materials to be separated from the blood absorbed by the cells—Fatty particles so abstracted from the circulation and deposited in the shape of adipose tissue—Basement membrane.

PATIENT.—YOU stated in our last conversation *that all organisation began in* CELLS! I am anxious to hear the full details of this cell-theory of living structure.

DOCTOR.—Plants and animals—the higher as well as the lower—agree in their elementary parts. They consist of an aggregation of CELLS. *All vital processes commence in cells. All organised structure is developed from cells.* The cells are minute microscopic objects—*closed sacs whose walls are composed of a delicate membrane.* They are actual organisms, each possessing an independent vitality of itself, and only requiring proper nutriment and proper temperature for its growth and function, till its term of life closes. The cell has the power of drawing into itself (endosmose) the nutrient materials around it, and of incorporating them with its own substance. Whilst the growth of the cell is thus taking place, preparations are simultaneously making for its renovated existence, *by the development within of the germs of new cells*—nuclei.

P.—All cells, then, originate in germs that have been prepared by some previously existing cell.

DR.—Precisely. The germ, nucleus, or reproductive molecule, is a minute granule adherent to the inner wall of the cell,—only visible by a microscope of high magnifying power. Afterwards these granules separate from the wall, and move about in the cavity of the cell. At a later period the parent-cell bursts and sets them free. *This finishes the life of the parent-cell, and begins the life of the succeeding new generation.* The young germs propagate their kind by a precisely similar process.

The germs are developed in two ways—first, *dependently, i.e.*, within the parent-cell; second, *independently, i.e.*, when set free by its rupture. In the former case, the granules derive their

nourishment from the fluid of the cell; their growth comes at length to fill the whole cavity of the cell.

P.—You stated that *these cells absorb, elaborate, change, and vitalise the nutritious fluids through which they float.* So that the peculiar endowments of cells are the simplest idea we can have of *life, or vital properties.* A cell is then, the type and starting-point of all organisation.

Dr.—It is the primary recipient of life, and imparter of life. When the cells have accomplished their function, their term of life, they burst or liquify. The successive generations of cells produced, undergo various departures from the original type, forming varied but associated structures. These are endowed with peculiar properties correspondent with, and dependent on, their peculiar modes of development and arrangement. Hence the variety of actions exhibited by the component parts of living structure. The several groups of these actions concur to some specific effect, and constitute *function, digestion, respiration, secretion, circulation,* are examples of the concurrence of many complex minor actions, and of the mutual relations of each group of them to the whole.

P.—But the properties and endowments of the vegetable and animal cells must differ materially.

Dr.—They do. The peculiar action of the cell-growth of plants, is to elaborate *organic* compounds from *inorganic* materials existing in the earth, or floating in the air. Animals, on the contrary, in their cell-formations, have no power of this kind. They cannot, like plants, *create* organic compounds. Their nutrition consists of the organic compounds formed for them by plants. For the elaboration and assimilation of the materials so organised, for the introduction of the new materials of structure, and the expulsion of the old, a vast proportion of the animal fabric is set apart.

P.—In this view of matters, then, the vegetable kingdom is strictly to be regarded as nature's great laboratory, wherein *inorganic* matter is transformed into ORGANIC.

Dr.—Simply, plants are a true *vitalising apparatus* or contrivance, by which *carbon, oxygen, hydrogen, nitrogen,* &c., &c., are converted into *wood, bark, juice, leaf, flower, fruit. This is nature's grand provision for animal nutrition.*

P.—You intimated that the constant renovation of each tissue is accomplished by the generation of cells. How is this brought about?

DR.—These are developed as the structure grows. The constituents of the cells may be of a nature to give solidity and durability to the structure. For example, the cells of the epidermis (scarf-skin) are strengthened by a deposit of horny matter, those of the bones and teeth by a mixture of mineral and earthy matter. On the other hand, the contents of the cells may be of the most evanescent nature, and therefore fluid, admitting easy decomposition. We find this to be the case in the cells of glandular structures. Therein successive crops of cells are generated as fast as the demands of the secretion require. In proportion as tissues are actively concerned in the vital functions—animal and organic—so is the rapidity with which one generation of cells is reproduced after another. This is at once the *rationale*, and the foundation, of the great law of animal organism, viz., *that the rapidity of the decay and renewal of structures, is in proportion to their high organisation and high functions.* Hence, those parts of structure that are subject to the most active vital change, are the softest and least permanent.

P.—By parity of reasoning, the most solid textures, as the bone and tendons, will undergo comparatively little change, will longest defy the disintegrating *hand of time.*

DR.—That is, the *action of the elements.* It is precisely so. For example, the nervous and muscular systems *are the prime instruments of vitality;* their particles, therefore, are of short-lived duration, compared with the bones and other solid parts, *whose offices in the system are chiefly mechanical.*

P.—This explains the need felt by the higher animals for constant supplies of food.

DR.—Yes; to compensate decay by renovation, to replace the portions of the fabric lost by wear and tear.

P.—This explains, too, why the young and growing require more food than adults; and adults more than the aged.

DR.—You quite comprehend the idea I wished to give you of nutrition. In proportion as the animal is young, so unconsolidated is the composition of its texture, so rapid their development, decay, and renewal. The same law and mode of development exist with regard to morbid growths, or tumours, called malignant. They are in their elements CELLS, *with the fatal power of indefinite reproduction.* Removal is no guarantee for cure, so long as germs may remain in the system.

P.—I already have a glimpse of the bearings of all this philo-

sophy of man in the sound state, on man in the diseased state. Can you explain why it is, that there is so great a variety of products, from cells so apparently identical?

Dr.—No answer can be given, or need be given, to this, but that *so is the will of the Creator—so is the constitution of the cell.* It lands us in an *ultimate fact.* As well ask—why, from the water, ammonia, lime, magnesia, soda, potassa, iron, and other elements of the soil, and the gases of the atmosphere,—why from principles so few and simple, should grow such an infinite variety of vegetable products, roots, trunks, stems, leaves, flowers, and fruits?

All true secretions are performed by the agency, the selective power of cells, developed in the interior of the secreting organs.

P.—That is a doctrine that astonishes me; nevertheless there is something on the face of it very like truth.

Dr.—It *is* truth. The materials to be separated from the blood are absorbed by the cells. The cell distended with fluid which it has elaborated into the given secretion, presently bursts, and yields its contents to the ducts by which the peculiar secretion is conveyed away. *Adipose tissue is a secretion of* FAT *from the cells of the tissue so called.*

P.—Are all animal tissues in the first instance developed from cells?

Dr.—All; except what is called *basement-membrane.* In this no cell-structure can be detected. It is a delicate structureless lamella, the consolidation of a plastic fluid, that has been elaborated by the cells. It is akin to the simple structure of the walls themselves. *This is the foundation-element of other structures.*

CONVERSATION THIRTEENTH.

Elements of structure—Characteristics of the several groups of tissues—1. Simple membranous tissue—2. Simple fibrous tissue (areolar or cellular tissue)—3. Simple cells floating in the animal fluids—Blood discs or corpuscles, red and white; their respective functions.

Patient.—I should like to know the minute details of the

ultimate structural arrangements and elementary constituents of the human fabric, as revealed by the microscope.

Doctor.—For this I refer you to distinct treatises on anatomy. Those details are more within their scope. They hardly comport with the objects of a brief *exposition* of physiology, and its bearings on medical practice, which is all that the limits of our conversations permit me to give. Nevertheless, I shall not leave your desire entirely ungratified. I shall glance at the characteristics and functions of the several groups of tissues which go to form the various parts of organised structure. The interest of the subject in itself, and its connexion with the matters of physiology and pathology afterwards to be discussed, will be ample amends for any little tax on your patience it may exact. We begin, then, with

1. Simple membranous tissues. These scarcely exist alone in the body, but go to form other compound tissues. *Basement-membrane* is the type of these. This is a delicate lamella, without structure and without cells, the simple consolidation of a plastic fluid that has been elaborated by the cells. It is best represented by the walls of the cells themselves.

2. Simple fibrous tissue. This used to be called *cellular tissue*. But it is now more properly designated areolar tissue. It consists of a net-work of minute fibres and bands, interlacing in every direction, leaving innumerable interstices which communicate with each other, and which are filled with a serous fluid. It is very elastic, has no vitality, receives few blood-vessels, and fewer nerves, and possesses no sensibility. It is easily regenerated by the simple consolidation of the organisable lymph of the blood deposited on surfaces, or poured out in inflammatory effusions. This tissue is of two kinds, *white* and *yellow*. The *white* enters into the structure of ligaments, tendons, fibrous membranes, and muscular sheaths; the *yellow* enters into the middle coat of the arteries. Being little subject to interstitial change, it requires little renovation.

P.—For the same reason, I conclude, it will have less tendency to spontaneous decomposition than any other part of the fabric.

Dr.—A true conclusion. Such is the fact. Of the elementary constituents of our corporeal fabrics we have, next,

3. Simple cells floating in the animal fluids. The red colour of the blood is due to these cells, which vary in size in different parts of the same body. They are flattened *discs* (like

coins), not *globules*, as formerly imagined. The membrane that constitutes the cell-wall is readily permeable by liquids, so that the contents of the cell vary with the density of the fluids in which it floats.

P.—According, then, to the law of endosmosis, I believe they call it, *too thick a circulating fluid will empty and shrivel the corpuscle?*

Dr.—Yes, precisely so. By the same law, on the other hand, *too thin a menstruum will cause the blood-corpuscle to absorb, till the cell-wall gives way, and the contents are effused through the surrounding fluids.* This will happen when the serum of the blood is of too low specific gravity, as in *anæmia*, *scurvy*, *purpura*, and other disorders of sanguification. There are *red* and *white* blood-corpuscles. They are nearly of the same size.

P.—I presume it to be probable, then, *that such alterations of the blood corpuscles*, from the varying density of the medium in which they *float*, *lie at the foundation of many disordered states of the system.*

Dr.—It is beyond all question,—seeing the extent to which we can modify the constituents and consistency of our fluids by diet. It is well ascertained, moreover, that abnormal substances in the circulating current, as *soda*, *bile*, and *urea*, *exert a peculiar solvent power on the blood corpuscles.* In this way alone can we explain many of the morbid effects of the retention of these substances The contents of the blood-cell are called *hæmatine*. *Iron* enters into the composition of the *tunic* of the *red* corpuscle.

P.—Have the blood-corpuscles, like the isolated cells, the power of reproducing themselves?

Dr.—Yes; with greater or less rapidity, according to the varying exigencies of health and disease, blood discs being developed from the granules, or cell-germs, they contain.

P.—What is the function of the *red* blood-corpuscle? It seems strange to me that it should have *iron* in its composition. This indicates something special.

Dr.—The function of the red blood-corpuscle is a nice question. Such blood-disc is only found in the higher, or vertebrated class of animals. In the lower classes, and in the very young embriæ of the higher classes, the colourless corpuscles (presently to be described) alone are found.

P.—That would favour the idea that red corpuscles are not essential to simple growth?

Dr.—It does certainly favour such an idea. In my opinion the red globules subserve more the function of *respiration* and *animal heat* than that of *nutrition*. The abundance of the *red* corpuscles bears a close relation to the *temperature* of the animal, to the amount of oxygen introduced into the system, and to the activity of the organic functions. They are, therefore, more numerous relatively in birds and mammalia, and least so in reptiles and fishes.

P.—Do the red corpuscles undergo much change in the course of circulation?

Dr.—Great, both in the pulmonary and in the systemic circulating systems. In the former, their colour is converted from *purple* into *vermillion;* in the latter, from vermillion to purple. In fact, the red blood-corpuscles are the *carriers in* of oxygen, and the *carriers out* of carbonic acid gas. In this way the blood is at once and at every instant rid of its impurities, and has fresh vitality imparted to it, by being brought into contact with the *subtle ether*, or *magnetic principle* pervading space, and mixed up with the more palpable gases of the atmosphere. These principles are co-essential to life with food. The *iron* of the cell-wall, by its affinity for electricity and oxygen, peculiarly fits it to carry these principles into the remote recesses of the organism, vivifying all they reach. Accordingly we find that acuteness of sensibility, and energy of movement, are animal endowments that rise or fall with the increase or decrease of the proportion of red corpuscles in the blood. This subject will be resumed when speaking of the function of respiration.

P.—What is the function of the *white*, or colourless, corpuscles of the blood?

Dr.—The elaboration of fibrine from albumen. Their proportion in the circulating fluids of animals of all classes, bears a relation to the activity of the formative processes. In the very young embryo of the mammalia, *i. e.*, at the time when growth is most rapid, there is a preponderance of the white corpuscles. As the energy of the formative processes of embryonic life diminishes, so does the amount of white corpuscles. In like manner they are found most numerous in the periods preceding the changes in the larva and pupa state of the insect, and in the blood of well-fed frogs. *They are scanty in frogs kept without food!* Their proportion greatly increases in an inflamed part; that of the red corpuscles is unchanged. When the blood has been drained

away the red corpuscles diminish, the white increase or remain the same. The white corpuscles do not peculiarly or exclusively belong to the blood. They are also found in the *chyle* and in the *lymph*.

These cells are, probably, the great vital transmuting agents, by which vegetable or animal nutritive principles are absorbed, elaborated, vitalised, and made part and parcel of the living structure.

CONVERSATION FOURTEENTH.

Elements of structure continued—Cellular covering of the outer and inner linings of the body—Epidermis and epithelium—Compound structures, mucous, serous, and synovial—Membranes—Tissues hardened by calcareous deposit: viz., bones and teeth—Tissues hardened by aggregation of cells: (a) mouths of intestinal absorbents; (b) substance of all the solid glandular bodies; (c) fat cells; (d) cartilage, cornea, crystalline lens, vitreous humour; (e) solid tubular tissues; (f) muscular and nervous tissues.

PATIENT.—WILL you proceed with your further elucidations of the elementary forms and principles of corporeal structure?

DOCTOR.—The free membranous surfaces of the body, the delicate protective outer lining of the skin and mucous membranes, consist of *cells*, which are developed from cells furnished by the subjacent membrane. The varying contents and endowments of these cells differ according to the varying function of the parts they cover. The epidermis, cuticle, or scarf-skin, consists of a series of cells, which when first formed are spherical. These cells gradually secrete a horny matter. They dry up, become flat and scaly, as the layer approaches the surface, and finally desquammate. The horny matter is identical in composition and structure with that of nails, hoofs, horns, hair, and wool. It has no vitality in itself. It has neither vessels nor nerves. It is pierced by the excretory ducts of the sebaceous and sweat-glands, and by the shafts of the hairs. The soft layer of cells lying on the *true skin* used to be called the *rete mucosum*. It was supposed to be a tissue of a distinct kind, and the exclusive seat of the colour of

the skin. The thickness of the epidermis depends on the number of layers of its cells. This varies in various parts, according as they are the seat of pressure; the activity of cell-deposits being always in proportion to the irritation set up in a part, and the amount of blood that irritation determines thereto, as we see on the thick skin of the soles of the feet, and on hands of labouring men. The colour of the skin is owing to the secretion of minute granules of pigment in the cells of the rete mucosum. This deposit is found remarkably on the inner surface of the choroid coat of the eye—the *pigmentum nigrum*. The development of these pigment-cells in the skin is much influenced by light.

P.—That explains to me how people are *tanned* by exposure to the sun.

Dr.—True. Such is the tanning process. But to proceed. The layer of cells covering the internal surfaces of the body, the internal epidermis in short, is named *epithelium*. This continuous layer of cells constitutes the exterior coating of all the *mucous membranes*, and dips down into their follicles and glands. It also covers the serous and synovial (joints) membranes, and the lining of the heart, bowels, blood-vessels, and absorbents. The forms of the cells are various. Some are laid in a tesselated way, constituting the *pavement epithelium*. Others are cylinders, laid side by side, resting on *the basement-membrane*. These epithelial-cells are continually being exuviated and renewed from the subjacent surface, according to the activity of the function of the part. *By the continual growth and casting off of the cells that line the glandular follicles* (*crypts*) *the various products of secretion are separated from the blood.* The alleged "microscopic organisms" in the rice-water dejections of cholera patients, and which, inhaled from the atmosphere, or swallowed with the food and water, *were supposed to be the material cause of the epidemic*, are in reality only these epithelial cells separated, scoured off, in unusual quantities.

P.—According to your account of the *cell-origin* of secretions, *one would expect* these appearances in such diseases as diarrhœa, dysentery, and cholera?

Dr.—So it turns out.

P.—I am to understand, then, that these *membranes, fibres*, and *cells* (which have occupied us in this and the preceding conversation) are the elementary components of the tissues of the human body?

Dr.—Yes; we shall now proceed to expound the simple compound structures, as MUCOUS, SEROUS, and SYNOVIAL MEMBRANES, which the union of these elements goes to form. The tissues in question consist of three chief parts. 1st, the *epithelium* or *epidermis* covering its free surface; 2nd, the *basement-membrane*, the larger beneath the first; and, 3rd, the lowest layer of all, the thickest, the laxest, the most elastic, viz., the *areolar tissue*, with the capillary blood-vessels, nerves, and fibrous filaments that interweave it with the parts it lines.

P.—The mucous membranes and skin are identical structures, I have heard say.

Dr.—They only differ in their outer layer of cells, hardening in the case of the skin, constituting the epidermis; and in the origin of the nerves distributed to them, the *mucous membranes* being supplied with *organic* or *ganglionic* nerves chiefly, and the *skin* with *animal* or *sensitive* nerves.

The mucous membranes, as well of the exterior of the body as of its interior tubes and cavities, are the great highways and thoroughfares of the corporeal traffic and interchange with the external world; the surface on which is spread the apparatus of external sensations and internal perceptions, or *reflex actions*. The mucous membranes of the digestive canal constituted the *medium* by which the nutrient materials of the body are elaborated and absorbed; also, the drains and gratings through which are cast out matters resulting from the decomposition of the body, the refuse residuum of the food, and whatever elements are unappropriated, through excess of supply, or defect of assimilation. The peculiarity of the mucous membranes is, that the stratum of epithelial cells, which covers them, *is constantly undergoing renewal*. This is the source of the protective mucus of the interior linings, whether in the *air-tubes*, *digestive canal*, *gall-bladder*, *urinary bladder*, or other open passages.

P.—What are the serous and synovial membranes, and what is the character of their elementary structure?

Dr.—They are the linings of the shut cavities of the body, which contain less or more fluid; the synovial membranes are those lining the joints, and secreting "joint oil," their free surface is covered with a single layer of *pavement-epithelium*, spread on a sheet of *basement-membrane*. This is attached to the substance beneath by a layer of condensed *areolar tissue*, which gives the membrane its chief thickness, toughness, and elas-

ticity (the subserous tissue). The filaments of this membrane are chiefly composed of yellow fibres, marvellously interlaced, and traversed by blood-vessels, nerves, and lymphatics.

P.—I am puzzled to explain to myself why such *hard* structures as bones and teeth are formed from *soft* cells, and how they are nourished.

Dr.—*Tissues are hardened by calcarious deposit, or by simple aggregation of cells.* In the former case, a degree of interstitial change is necessary to adapt them to the purposes of growth. The substance of bone itself is non-vascular.

P.—There's just the difficulty, it seems to me, to provide for the permeation of a nutritive fluid through a dense mineral matter, like bone or teeth, which must necessarily be without blood-vessels.

Dr.—A human artificer, truly, would be here conscious of his limited powers; but the resources of Divine contrivance are illimitable. This point, which puzzles you, is gained by a series of minute chambers, connected with still minuter passages, excavated in these solid substances. In this way the blood-vessels of the nearest surfaces supply nutritive materials for bone, and render it capable of self-repair, in disease or injury. The nature of the ossifying process, or the regeneration of bone, cannot be entered on here. Teeth are allied to bone in structure.

P.—What are those tissues you have just referred to, *as consolidated by the simple aggregation of cells?*

Dr.—(*a*) The mouths of the intestinal absorbents hold a cluster of such cells. From these the lacteals take their origin. Before food is supplied, or absorption takes place, they appear a collection of granular germs imbedded in the *billi*. But when surrounded with nutriment, they develop themselves, select, absorb, and prepare the nutrient matters. They then burst or deliquesce, and deliver over their charge to the lacteals.

(*b*) The substance of the liver, pancreas, and, in short, that of all the solid glandular bodies, is a congeries of such cells. These cells are the efficient instruments in the secreting process.

(*c*) Fat cells, or adipose tissue. These are held together by the net-work of areolar tissue.

P.—What are the uses of fat in the animal economy?

Dr.—Manifold. In one capacity it serves as a veritable *body-casing* and *padding*, to cushion the various structures of the fabric, to fill up interstices, to admit facile motion between contiguous

parts, as a non-conductor to retain animal heat. In another capacity it serves as a reserve of combustible matter, to be drawn on when directer sources of supply fail (as in starvation), and as a sort of waste-pipe provision or stow-away place, to prevent the injurious accumulation of alimentary matters in the blood, over and above the real wants of the economy.

P.—But does it necessarily follow that an abundance of fat-forming materials in the blood should show itself in the generation of adipose tissue?

Dr.—The two are not always combined. Many take even a great excess of fat-forming nutriment without getting fat. In that case, what would injuriously accumulate in the blood, is eliminated by the liver, sometimes by the kidneys. Hence those who *should* become fat, from the quantity of carbonaceous matters that they take, are apt to have the liver disordered, from the extra-labour thus imposed on it.

P.—That, then, must be the cause of the eternal and miserable complaints of *biliousness* by lean people, who are disposed to *cram*. Such an one was Pope, and others I could name. Who will trace for us, and develop as a beacon to future generations, the cause of the gratuitous sufferings, and premature deaths, of many of the great luminaries of literature, art, and science?

Dr.—The same cause explains the comparative immunity of fat people (healthily so) from the bilious complaints in question.

P.—Proceed, then, with your illustrations of cell structures.

Dr.—(*d*) Cartilage (gristle) is another instance. It has a large quantity of peculiar inter-cellular substance for the basis, or mesh-work, on which the cells are laid. The *cornea*, *crystalline lens*, and *vitreous humour* (interior fittings of the eye), are structures essentially the same as cartilage.

(*e*) Solid tubular tissues. The formation of capillary blood-vessels takes place *by the conversion of a string of cells into a continuous tube, by the breaking down of their transverse partitions*. In the valves of the veins, we have an instance of these original partitions preserved in part. This capillary tube coalesces with others in like manner, so as to form a vascular network, by which the materials of growth and renovation are conveyed to all parts of the animal tissues.

P.—Are the *capillaries* similar in function to the large *blood-vessels*?

Dr.—No. They are quite distinct. The latter are simply a

circulating apparatus, mere conveyance-pipes to and from the interior recesses of the organism; nature's laboratory and *penetralia*, wherein are carried on the characteristic functions of the animal. In those minute vessels take place the organic changes referred to—nutrition, secretion, respiration, &c.

P.—But nutrition can be carried on independently of capillary vessels, as you instanced in the case of bones.

Dr.—Well remarked. These, with cartilage (designated *white tissues*), and the islets, in the midst of the capillary net-work everywhere, are the instances exceptional to this rule. In these cases, the nutrient materials conveyed by the blood, are absorbed by the cells, or other elementary parts of the tissue immediately adjoining the vessels, and are imparted by them (by endosmose) to others, which are further removed.

Here we shall stop for the present. We shall resume this subject at our next conversation.

CONVERSATION FIFTEENTH.

Muscular and nervous tissue—The process of muscular contraction—Activity of waste and repair in muscle—Nervous tissue; central masses (ganglia), trunks, and branches—Nerve fibres and nucleated cells—Fat and phosphorus (?) of nerve-substance—Rapidity and extent of its interstitial change.

Doctor.—(*f*) Muscular and nervous tissues. Up to the point where we last left off at, the animal fabric is constructed upon the very same type as that of plants. The parts concerned in nutrition, secretion, respiration, and reproduction, the vessels that convey the fluid equally with the solid portions of the frame-work, *all have their origin in cells.* The tissues that now fall to be discussed, are quite dissimilar in their properties and purposes. *They concern a class of functions which have no analogue in plants.*

Patient.—I quite understand you. The one of these tissues is the agent of the palpable movements of the body. The other is the instrument of its sensations.

Dr.—Yes,—and the exponent of its volitions, its thoughts, its emotions, its instincts, &c.

P.—Herein, therefore, and hereby a broad impassable line of distinction is drawn between the vegetable and animal kingdoms.

Dr.—Yet the ultimate structure of these tissues conforms exactly to the simple *cell-type*. The elementary fibre of muscle, is a tube formed by the coalescence of a linear series of extremely minute cells, with a peculiar interior deposit. So also the nervous *striæ*, whose bundles constitute the nerve-trunks, are tubes of the same cellular character.

P.—This interests me much. Please, describe to me, more particularly, the elementary structure of muscles.

Dr.—The primitive muscular fibres are arranged in *fasciculi*, or bundles, of larger or smaller size, by means of areolar tissue. These elementary particles, or primitive *fibrillæ*, are arranged in two directions, one set longitudinal, the other set transverse, and are bound together by a very delicate tubular sheath (myolemma), distinct from the areolar tissue.

P.—What does the process of muscular contraction consist in?

Dr.—An approximation of the transverse striæ, and a general shortening of the fibre. But all the fasciculi are not in contraction at once. The tension is effected by a continual change of parts, some relaxing, others contracting. The fibres of the muscles of organic life present no transverse striæ, and but very faint longitudinal ones. They consist of tubes arranged in parallel bands, or fascicula. These fasciculi are interwoven into a net-work, and have no fixed points of attachment, but contract against each other. This is the nature of the structure composing the walls of the gullet, stomach, intestinal canal, heart, bronchial tubes, bladder, uterus, gland-ducts, &c. The action of muscular tissue is beautifully exhibited in the movements of the worm.

P.—From the very nature of muscles, and the incessant, and often excessive, demands made upon them, as well as from the development we see them assume by exercise, I infer that their facility of growth must be great?

Dr.—Yes; the process of interstitial change,—the renovation of the component cells of muscles,—is rapid in proportion to the activity of their exercise, and the energy of the nutritive functions. But, notwithstanding this facility of development in muscular substance, its actual destruction (as of a part cut out or torn out) is never repaired. This loss of muscle is replaced only by areolar

tissue, which is gradually condensed, but never becomes contractile.

P.—Muscle, also, I presume, is copiously supplied with blood, as the activity of its waste and regeneration demands?

DR.—It is. But its fibres are not penetrated by vessels—the capillaries being distributed in the minute interspaces between the fibres; and perhaps *there is no fibre without its attendant capillary.* This copious supply of blood is necessary, not simply for nutrition, but for the supply of oxygen—an essential condition of muscular irritability and activity. *Every contraction of a muscle takes place at the expense of the combination of oxygen with the elements of its structure.*

P.—That is the reason, then, of the demand for nutrition, and of the augmented respiration, occasioned by muscular exercise?

DR.—Precisely. *The high vital activity and importance of any structure, bears a direct relation to the amount of blood it receives,* and therefore to the readiness of its disintegrations and renewals.

P.—And, for the same reason, the less will it be able to endure deficiency of supplies.

DR.—Of course. Thus, the muscles of cold-blooded animals maintain their irritability for a much longer period when their supplies fail—when the conditions of their energy are cut off.

P.—The law, then, seem to be this—*that in proportion as a structure is slow to decompose* (*as cartilage*)—i. e., *in proportion as its vitality is low, so much the more tenacious is it,—so much the longer does it retain its power of acting, after the withdrawal of the conditions of action.*

DR.—That is precisely its expression!—The muscles of ANIMAL LIFE, after the skin, are the most copiously supplied with nerves, —chiefly *motor,* blended with a few *sensory.* Muscle, as to its chemical constitution, may be called *solidified blood.* There is no difference in their elements.

P.—THE NERVOUS TISSUE, as it is still more wonderful in endowments, must be still more extraordinary in structure, than the muscular?

DR.—It is, as far as we know, creation's masterpiece! By its large endowments in us, we alone of all animals, are fitted to know, to scrutinize, to appreciate the Divine handiwork, and worship the Maker of our frames, the Father of the spirits of *all* flesh. Nervous tissue consists of central masses, or GANGLIA, and trunks, and branches, which transmit, in either direction, the influence of

actions that take place at either extremity. Nervous matter is composed of two primary elements; 1st, nerve-fibres; 2nd, nucleated cells, or vesicles. In the nuclei of these cells are pigment granules; to this is owing the gray colour of the *cortical*, or *cineritious* structure of the brain and ganglia. The ultimate nerve-fibre is a cylindrical nervous sheath, enclosing the nervous matter, which is soft, pellucid, aud homogeneous. *This tube seems continuous from the nervous extremities to the nervous centres.* It has no blood-vessels, and forms no anastomoses. *Trunks are composed of these tubular nerve-fibres, bound up with blood-vessels, areolar and fibrous tissue.* The first development of nerve-tubes is precisely analogous to that of capillary vessels, or muscular-fibre—*i. e., a string of primary cells coalescing into a continuous tube.*

P.—Are these nerve-tubes, when destroyed by injuries, &c., ever regenerated?

Dr.—They are; as is clearly proved by many pathological facts and surgical experiments. Whether for the conduction of motion, or sensation, the nerve-tube must be unbroken.

P.—What are the essential constituents of the central or *ganglionic* masses of the nervous system?

Dr.—They consist of nucleated cells, or vesicles embedded in a fine granular matter, and traversed by capillary blood-vessels. The nerve-tubes simply enter the ganglionic centres, wind their way among the cells, and then emerge from the mass. There is reason to believe that the arrangement of the nerve-fibres is alike at the nervous centres and at their extremities. The *motor nerves* have no proper terminations, their ultimate ramifications forming a series of loops, returning into themselves, or joining others. The arrangement of the *sensory fibres* is of the same sort.

P.—Is anything known of the alterations these ultimate elements of nervous structure undergo in the actions connected with sensation?

Dr.—It seems to be a law of the nervous structure, that wherever a change has to be originated, we have a layer of nucleated globules, and a plexus of fibres (nerve-tubes) and capillary vessels. This arrangement is found at the origin of the sensory nerves, *i. e.*, on exterior surfaces, as on the retina, the olfactory and auditory nerves, probably in the papillæ of the skin and tongue.

P.—Is there anything remarkable in the chemical constitution of nervous matter?

Dr.—Much. The peculiar cell substance is *fat* and *phos-*

phorus (?). The amount of the latter is greatest at the age of greatest *thought!* In infancy it is scanty; so in old age and idiocy.

P.—For the same reason as in the case of muscles, I infer that the nervous system is copiously supplied with blood.

Dr.—It is, and necessarily so. The vesicular structure is embedded in a minute capillary net-work. In the fibrous trunks, the vessels run alongside, connected at intervals by transverse branches. *The supply of blood to the brain is beyond all proportion greater than to any other organ.*

P.—*This is the surest index of the active function of the organ.*

Dr.—Yes; *and hence also of the rapidity and extent of its interstitial changes.* Every vital operation, as I before showed, induces a change of structure. This is an essential condition to the manifestation of power, or the exercise of a function.

P.—You said that the oxygen introduced by the arterial blood united with the ultimate elements of structure.

D.—That being the case, the death and disintegration of a minute portion of mature cells so induced, makes a corresponding repair necessary; calls up an effort of nutrition to replace that which has been removed. The products of decomposition found in the excretions, demonstrate this waste and reproduction of the nervous substance. From analogy, it may be presumed that the nerve-cells are reproduced in precisely the same manner as the epidermis-cells are carried forward to the surface, *i. e.*, are developed in successive layers, from the *pia mater* to the interior, where they are connected with the tubular portion of the nervous tissue.

CONVERSATION SIXTEENTH.

Of the general functions of the nervous systems of man—The organic, the reflex, and the animal systems—Visceral ganglia—Spinal chord—Brain.

Patient.—I am particularly anxious to have a clear, connected, and concise view of the grand systems and functions of the nerves,

as they are so often evoked by you, and evidently form so large an item in the explanation of the symptoms of disease. In modern times, if my reading informs me rightly, great discoveries have been made in this department of physiology. To judge from myself, a popular exposition of this subject must be a great desideratum with unprofessional readers.

Doctor.—The subject, truly, is of equal importance and interest, but one too little understood. It is the basis at once of sound pathology and successful practice. Artificially to split the nervous system into separate individual organs, aids us in its clear comprehension. But it is only when such organs are viewed *as a whole*, united as they are by close anatomical dependencies and connexions, that the full significance of their wondrous plan comes out. They may be truly said to constitute *the Divine masterpiece of animal mechanism!* Considered simply as a fertile field of Natural Theology, the nervous system remarkably illustrates the high attributes of Deity.

I should say to the lay reader, who wishes to understand *well* the general economy of the human frame-work, the causation of disease, its symptoms and its sympathies, its modes of propagation throughout the various structures of the body, together with the philosophic principles and processes of its restoration to health, I should say, *study the nervous system* in all its departments or divisions.

P.—I shall patiently, and with much interest, hear your exposition.

Dr.—For the purposes of the existence of plants, a simple circulating apparatus suffices. But the complex functions of animals necessitate mechanism of a higher order, to which nothing analogous is found in the vegetable kingdom, viz., a NERVOUS SYSTEM, or, more properly speaking, *a series of nervous systems.* Their office is threefold:—

1st. To be an actual and active *source of power* to the various animal structures and organs. (This is independent of the question "*whether contractility be an inherent property of muscles*," which I believe it to be, and as Haller long ago demonstrated.

2nd. To be the *instruments of relation* with the external world.

3rd. To be a *bond of union* between the several contractile tissues of the animal, to harmonise and control their movements, and to act as an *internuncio* and *interconductor* between all parts

of the organism; subjecting them to certain common influences for good or for evil, and pre-eminently making the complex parts of the mechanism into one grand whole.

The nervous centres are disposed into, or constituted of, what are termed GANGLIONIC MASSES—agglomerations of vesicular nervous matter.

P.—I recollect. You explained the nervous structure before, under the head of the elementary tissues of the human body.

DR.—Yes; these *ganglionic masses* are the sources and elaborators of all nervous power. Into these enter, from these proceed, the various *nerve trunks*, whose *branches* penetrate and pervade every structure.

P.—What are these *nerve-trunks* composed of?

DR.—Bundles of *nerve-fibres*, of various endowments and offices. The fibres are mere conductors of power or intimators of impressions. They are divided into two great classes, 1st. AFFERENT, or *centripetal nerves*. 2nd. EFFERENT, or *centrifugal*. The former commence on the surfaces, and terminate in the vesicular matter of the nervous centres. The latter originate in the vesicular matter, and end in the *muscles* and *skin*, or *mucous membranes*.

The ganglionic masses are numerous, and each *independent* sources and centres of nervous power; yet all intimately allied, co-working and co-sympathising.

P.—Will you enumerate these ganglionic centres?

DR.—1st. THE VISCERAL GANGLIA. These include not only the SEMILUNAR and CARDIAC GANGLIA, but also the chain of *cranial*, *cervical*, *thoracic*, *lumbar*, and *sacral* ganglia, that form a netting along the entire front of the vertebral column; to these may be added numerous minuter ganglia, as well as those at the posterior roots of the spinal nerves.

P.—Where are the branches of the semilunar ganglia distributed?

DR.—Among the ABDOMINAL VISCERA.

P.—Those of the cardiac ganglia, from their name, I infer, go to supply the HEART.

P.—Just so, and also the VESSELS proceeding from it. *These nerves accompany the arterial trunks through their whole course*, ramifying minutely upon their surface, and *intimately influencing their functions*, especially the actions of nutrition and secretion. Taken altogether, these ganglionic centres and ramifications constitute THE SYMPATHETIC OR ORGANIC SYSTEM OF NERVES.

P.—You are coming to what interests me much, and of which I have hitherto had but a very vague conception.

Dr.—It may, perhaps, surprise you, with your preconceived notions on this subject, to learn, that *the system of organic nerves is developed in animals, not in the ratio of the activity of their nutritive functions, but in the ratio of the purely animal,* or more exalted functions!

P.—Organic innervation, then, does not bestow an active moving power on the viscera under its control?

Dr.—You are too fast. Such inference is not justified. I freely admit that one grand office of the organic nerves is to be a means of inter-communication between distant parts; to associate, control, and harmonise the organic movements; to render the grand visceral functions subject to certain influences from the higher or animal functions, and *vice versâ*:—in short, to bring them to mutually sympathise in the weal or woe of each other. But I cannot believe this to be all. The means are disproportionate to the end. It is contrary to all analogy, that the Creator should use a complex agency, like the organic and excito-motory nervous apparatus, for so simple an end as that of mere sympathetic connexion. I freely admit that muscular fibre *per se* can contract. But a *muscle* (a bundle of such fibres) executing a specific action, in association with other muscles, always has a supply of nerves, which clearly, in the higher animals, *impart energy* to the exercise of that muscle, and which constitute, to all intents and purposes, *its active moving power.* Of two men, or two horses, similar in build, bone, and muscular development, that one will perform the greater feats of strength which has the larger nervous development.

P.—That is well known. Hence "*blood*, *bottom*, and *pluck*"—cant phrases for the elements of energy and endurance—refer more to amount of nerve than to amount of muscle.

Dr.—Undoubtedly so. Nevertheless, this sympathetic influence of the animal upon the organic functions, and *vice versâ*, is not a trifle. It is, on the contrary, a point of high moment practically to the physician; and wherever I can, I wish to turn abstract scientific truth to practical account. The volitional movements of man—the excesses of his passions, appetites, and emotions, through the medium in question, all powerfully affect and derange this system, *often laying the foundation of his gravest chronic maladies.* In brutes, who obey their instincts, and who live in a state

of nature, disease of these nervous centres, so fertile a source of misery to man, is not known.

P.—Please to tell me about the SPINAL MARROW, or CHORD.

DR.—This is part and parcel of the mechanism of the organic nervous system; yet as a chain of ganglia it is distinct and independent.

P.—It is not then, as long supposed and taught, a mere appendage to, or prolongation of, the brain?

DR.—It is not. It is a nervous apparatus distinct and *sui generis*. It is, in consequence of its AFFERENT and EFFERENT fibres of nerves, pre-eminently the seat and instrument of what is called REFLEX ACTIONS, or EXCITO-MOTORY MOVEMENTS. The spinal chord forms, also, a sort of connecting link between the organic and animal nervous systems. For, through it volition and sensation are transmitted; and from it, as well as from the brain, is draughted off ganglionic power, when the organic functions are too severely tasked.

P.—This REFLEX FUNCTION, you have so often mentioned, I wish, above all things, to be explained to me; for it is highly interesting, and wonderful in design.

DR.—*Reflex movements* are performed independently of the will, without consciousness, and without sensation (in the healthy state), by the simple contact of the contents of the hollow viscera, as the gullet, stomach, bowels, heart, bladder, &c. The impression is propagated by *afferent* (*centripetal*) nerves to the spinal chord, or the medulla oblongata (its prolongation into the cranium), where a respondent motor impulse is excited, and whence it is transmitted by *efferent* (*centrifugal*) nerves. Reflex action depends on the completion of the nervous circle in the grey ganglionic mass, in each segment of the *chord*.

The spinal chord consists of two lateral halves. Each spinal nerve arises from two sets of roots, an *anterior* and a *posterior*. The *white fibrous tracts* of the spinal chord are continuous with those of the brain. The ganglionic portion is principally composed of grey matter. The quantity of grey matter in a ganglionic mass, bears always a direct relation to the amount of influence to be exerted. Into the grey matter, and returning thence, a portion of the roots of the spinal nerves may be traced. Others pass on continuously to the brain.

Each spinal nerve contains at least *four* sets of fibres, inclosed in their respective sheaths, or bundles.

1st. A sheath of *sensory chords*, passing continuously to the brain.

2nd. A bundle of *motor nerves*, conveying the influence of volition and emotion downwards from the brain.

3rd. A bundle of *excitor* or *afferent nerves*, terminating in the true spinal chord, or ganglion, and conveying impressions into it.

4th. A bundle of *motor* or *efferent nerves*, emerging from the same ganglionic centre, and conveying the motor energy emanating therefrom.

The *posterior* or *afferent* roots of the spinal nerves unite the *first* and *third* of these bundles. The *anterior* or *efferent* roots unite the *second* and *fourth*.

The great *excitor or motor nerve* in the acts of respiration, circulation, and digestion is the PAR VAGUM, which takes its origin in the *medulla oblongata*, and gives branches to the pharynx, larynx, heart, lungs, œsophagus, and stomach; uniting these important parts, in the most intimate sympathy and friendly association.

P.—Situated at the base of the brain, as you have described the medulla oblongata to be, Nature seems thus to have chosen, with curious and watchful care, to locate the sources of the most vital actions in the best protected parts of the organism.

DR.—True; in these studies, we are incessantly called upon to venerate the abundant benevolence with which all design in the human body is carried out. The *inlets* by which the food and air find entrance, and the *outlets* by which the excretions find exit, are subject to the control of the excito-motory or spinal system of nerves. They are to a certain degree, also, under the influence of the will. Deglutition is, as a reflex act, the result of a stimulus applied to the fauces. *We cannot always swallow at will, nor can we ever restrain the tendency once it is excited.* By the same law, by means of the same mechanism, the contact of a noxious gas, or the collision of a hard substance with the glottis (the entrance to the windpipe) causes the latter spasmodically to close against it. The action of the sphincter muscles which guard the cardiac orifice of the stomach is *reflex*. It yields and opens to the pressure of the swallowed morsel, and it then closes so as to retain the food during the churning movements of the stomach. The latter, with the peristaltic (propulsive) movements of the bowels, are referrible to the direct stimulation of the simple contact of the food. The muscular coats of the rectum and bladder are,

in like manner, excited to contraction, by the direct stimulation of their contents, aided by the combined contraction of the abdominal muscles; the sphincter of the cardia being closed, the force must act downwards upon the walls of the rectum and bladder.

P.—The action of the *expulsors* and *sphincters* are thus continually balancing each other.

Dr.—Yes; if the intrinsic or internal stimulus be deficient, the will must aid the expulsors.

The closure of the pupil of the eye against strong light, and of the eye-lids against external irritants, are *reflex acts.* The rapid vibrations of the wings of insects, and of birds, are not volitional movements, but *reflex acts*—albeit they begin and end, in obedience to the will. Hence the occasional long continuance of the latter, as in the flights of migratory birds, comparatively, without fatigue. The grasping and perching on twigs, by the bent claws of birds, is a further instance of *reflex action.*

Locomotion of the lower extremities is to a great extent a *reflex action.* So also is *muscular tension* and *antagonism.*

P.—I have observed this want of tone or tension in the paralysed side of a face.

Dr.—Right; there the features are drawn together towards the side where their tone is still retained by the muscles.

III. The third series of ganglia are those of THE NERVES OF THE SPECIAL SENSES. Their locality is the continuation of the medulla oblongata. They are the instruments of the *instinctive actions* of animals; also of human emotions, feelings, passions, and appetites. The organs, whose nerves proceed from these ganglia, are placed in immediate proximity with the entrance into the alimentary canal.

IV. The CEREBRAL HEMISPHERES are the GANGLIA (par excellence)—the seats and instruments of the will, and the intellectual faculties of man.

V. Lastly, the CEREBELLUM is a vesicular nervous mass, and *source of power.* Its ganglia are for the co-ordination, adjustment and combination of the locomotive actions.

The nutrition and will being of these last two division of ganglia, are under different laws from those that regulate the first three series of ganglia. Being the seats of voluntary efforts, and of the more exclusively *animal* functions and endowments, their exercise produces more or less speedy exhaustion. *Volition* is exhausting. *Hence the amount of the exhaustion is in the measure of the*

force and continuance of the volitions. This is a grand law of the organism, not well understood in the *theory of healing*, and much neglected, if not wholly discarded, in the *practice of healing*. In proportion as an individual has wasted himself by voluntary exertion, *i. e.*, disintegrated his brain, and diminished the nervous energy, that should thence have flowed to the other nervous centres, in that proportion is a season of cerebral torpitude necessary, to stop the disintegrating process, and to repair the loss that has been sustained.

P.—What do you call that season of cerebral torpidity?

Dr.—Sleep. *The other nervous centres know no exhaustion of this sort. The will there has no control, and therefore operates no disintegrating effects.* The common processes of repair suffice to replenish the waste their exercise entails.

P.—By that showing of the matter, therefore, *the visceral and spinal nervous centres never sleep?*

Dr.—No; they require it not. They know no intermission of action. They go on at their own speed, as appointed by their Creator. They may be surcharged with work, or with materials of work, but they will not easily work under *high pressure*, as the brain is so often forced to do, in the necessitous pursuits, or mad passions, of mankind. If so compelled, they sooner or later revenge themselves by *bursting the boiler*, or to carry out the metaphor, otherwise straining the machinery to its irremediable damage.

CONVERSATION SEVENTEENTH.

The animal and organic functions continued—The organic, involuntary, or vegetative functions—The animal nervous system the medium of the mind of man—Muscle and nerve instruments of thoughts—What is the influence of the organic nerves in nutrition?—Nervous system compared to a republic of confederated states.

Patient.—It is very clear from the tenor of your last conversation, that the distinction of the animal and organic functions of

the human body is valid and vital. Will you please to enlarge upon this topic?

Doctor.—Most gladly. The movements implied in the performance of the vital functions necessitate the intervention of a nervous and muscular system. The intercommunications of the nervous system are a sort of corporeal *telegraph wires*, by which behests are transmitted from the sources of impression, to the agents of motion, and *vice versâ*. Through all grades of animals, above the very lowest, wherever muscular contractility is needed, or any peculiar operations by means thereof, there is always an associated nervous structure. *The stimulus to muscular movement — whether voluntary or involuntary — always operates through* INNERVATION.* In the former case, that of voluntary movement, the stimulus is purely nervous, one of thought or will. In the latter case, the stimulus that provokes the activity of the muscles of ORGANIC LIFE, *i. e.*, the involuntary or automatic movements, is one of the *reflex* class, generally the simple stimulus of *contact* or *distension*. Muscular contractility is only called forth in obedience to appropriate stimuli. To send forward the impressions of that stimulus, and to arouse the contractile efforts the necessities of the case demand, are the sole uses and functions of the nervous distribution we find in the organs of *vegetative life*. Organic actions may go on without brain, *i. e*, without perception, thought, or volition, but not without a spine, nerves, and visceral ganglia.

P.—This *vegetative* or *nutritive* system you allude to is the ORGANIC SYSTEM OF NERVES?

Dr.—Yes; otherwise called the GANGLIONIC SYSTEM. It merely concerns *individual* or *intrinsic life*. It presides over the *vital* or *involuntary functions*—all motions that are performed spontaneously and unconsciously. The organic nerves are not conveyers of sensation in the usual acceptation of the term, and are withdrawn from the control of the will. They accompany every blood-vessel, and permeate every tissue. They pervade the *animal* nervous system, and subserve the nutrition of the brain and spinal chord. They lie at the foundation of the grand functions of digestion, assimilation, secretion, excretion, respiration, circulation, animal heat, &c. These nerves confer on the tissues what is termed their

* This term is borrowed from the French, and now naturalised in our medical phraseology. It seems to embrace the functions of the nervous system generally.

irritability; in other words, their organic vitality, their power of being acted on by their appropriate stimuli. On the organic nerves the first impression of disease is usually received, and through them it is transmitted. In short, the functions of the *organic* or *vegetative* system, and *the parts under their dominion*, have for their object to maintain the integrity of the structure, to repair its waste, to counteract its decay, to afford the conditions for the full play and development of the animal powers. The ORGANIC GANGLIA are partly the media of reflex movements. They are the excitors of power, in obedience to stimuli.

P.—Well; what is your account of the ANIMAL SYSTEM OF NERVES?

DR.—They are those by which the individual brings himself into relation with the world without. They constitute the CEREBRAL SYSTEM and ITS ADJUNCTS. They furnish or regulate the instruments by which the animal takes cognisance of what occurs around him, by which he acts upon others, or is acted on in turn. They perceive the wants of the economy, and exercise themselves in the supply of the external materials necessary thereto. These comprise the conscious, voluntary, and sensible acts of the living being,—the expressions, movements, and feelings, which peculiarly and exclusively characterise the creatures constituting the animal kingdom.

P.—The animal nervous system, therefore, is the medium of the mind of man!

DR.—Yes; muscle and nerve are the instruments of thought. In no other way can ideas emanate from one being to operate upon another. Language, literature, look, gesture, are the muscular and nervous moulds, as it were, in which mind is forced to throw itself in the present state of being. *The organs of sense* are instruments of particular mental faculties, and constitute the great highways of communication between the world within and the world without.

P.—I consider that, on simple physical principles, the various special senses, as sight, hearing, smell, &c., are instruments exquisitely adapted to convey the particular impressions they take cognisance of.

DR.—They are. In man, the purely organic or vegetative life is subordinate to, and for the mere support of, the animal or psychical functions. On the due supply of the former, the activity of the latter depends.

P.—When you come to that, indeed, the most powerful stimulus to man's mental exertions, is the necessity of provision for his nutritive functions.

Dr.—True; his muscular and nervous systems, the prime agents of his animal functions, are his predominant characteristics, and would still constitute him man, if they could be preserved intact, and all the other parts destroyed.

When the fabric has attained its full development, the activity of the *organic* functions keeps pace with that of the *animal—sometimes are prematurely worn out in order to do so.*

P.—That is a startling and pregnant thought.

Dr.—It is a highly suggestive truth. But it is one which touches on considerations of PATHOLOGY and PRACTICE to be taken up in their place. At present we cannot afford to diverge from our main route. The reason of the fact stated is this, that the exercise of the animal functions—of the brain, nerves, and voluntary muscles—produces great structural waste. Every effort of thought, every impulse of volition, every contraction of a muscle, requires, as its necessary condition, the disintegration of a certain portion of the structure, and the union of its elements with oxygen. The rapidity of the disintegration of the tissues is in proportion to their functional activity, and their renewal is correspondingly rapid. The excretions, therefore, *i. e.*, the products of the disintegrated tissues, augment with the activity of the animal functions, and diminish with the degree of their disuse. This is most palpably seen under muscular exertion, that is, in the waste produced by bodily labour.

P.—Does the same law hold good in the case of *brain* labour, thought or care, grief or passion?

Dr.—It does. These *consume* the nervous structures as exercise consumes the muscular. The nervous centres in this case undergo increased disintegration, and proportionate is the demand for blood to the brain, that is, for the elements of reconstruction and of nutrition.

P.—You said that the animal and organic functions were mutually dependent on each other.

Dr.—Yes. For example. The organic functions are dependent on the animal so far as sensation, thought, volition, locomotion are necessary to obtain possession of the food, and in man to prepare and fit it for nourishment. Its ultimate appropriation is the concern of the organic functions. The animal functions, in

turn, are intimately dependent on those of organic life. The nervous system can less than any other bear an interruption to its circulation, or vitiation of its nutrition. Morbid action of the ganglionic nerves, by its influence on the blood-vessels alone, will impair the nutrition of parts supplied by the affected vessels. Impairment of the functions of animal life, *i. e.*, disorders of the higher or encephalic nervous system, have their foundation in faulty performance (however induced) of the nutritive functions.

P.—Do you mean to say that sensation, volition, thought, emotion, &c., are quickened, diminished, or perverted by disease of distant parts, especially of the nutritive centres and apparatus?

Dr.—I do. The fact is unquestionable, and it is important to know it. This is the root of *hypochondriasis* and *insanity*. In ninety cases out of a hundred of these disorders the fountain of the evil is not in the brain, *but in painless abdominal disease.*

P.—*Which, because painless, has so long escaped the cognisance of both patient and practitioner.*

Dr.—Just so. Hence the injury and injustice done to such patients by treating their mental miseries as feigned or imaginary. I have seen very many suffering persons make believe, and anxious that they should be thought well, but cannot recall one who pretended to be ill, when he was really well.

P.—Such facts—the facts you state of the true, perhaps the unsuspected source of those miserable mental maladies, place in a striking point of view, the importance of avoiding the production of morbid sensations in the vital seats and centres, and of cultivating only general sensations there.

Dr.—Yes; but proper or healthy sensations there—those arising from the healthy satisfaction of normal wants, not the morbid satisfaction of abnormal cravings; as unwholesome tipples, irritant condiments, &c.

P.—What do *you* call *tipple?*

Dr.—Oh! that is anticipating. We shall leave that till we come to discuss the questions of diet, &c. To proceed. By the present showing, then, irregularities in the quality or distribution of the blood are one of the mainsprings of the mischief in disorders of the nervous system; the cure is mainly to be sought, and addressed, *through the blood—in means that improve its quality, and correct its distribution.*

P.—That is an argument for your WATER-CURE, that comes upon me as forcibly as unexpectedly. I had always heard that the

boast—the justified, the unquestioned boast—of the Water-doctor, was the power of his system to *improve the quality*, and to *correct the distribution of the blood.* And from the new light you give me of the origin of nervous diseases, I can at once perceive the *rationale* of your immense success in their treatment. The same light suffices to show me clearly, how impossible it is to treat such diseases successfully by medicinal means, sanguineous depletions, or the starvation system; the one *impairing*, the other *impoverishing* the blood.

Dr.—You judge impartially and correctly. But allow me to correct an error you may be very likely to fall into here, from the undoubted reciprocal relations of the nervous and nutritive systems. The nutrition of animals, as of plants, is to a great extent the result of the independent vitality of the circulating fluid. In this way the primary tissues of the embryo are developed, and the processes of organic life are comparatively far advanced *before nervous matter is formed.* Afterwards, however, the organic nerves are found minutely to intertwine the coats of the blood-vessels.

P.—If, then, the organic nerves have no influence on nutrition, what meaneth this supply of them to the blood-vessels, as you now describe it? *Cui bono?* This is to me an anomaly on the theory that nutrition is independent of innervation.

Dr.—I will give you *my* solution of the difficulty. One *obvious* reason for this nervous distribution to the blood-vessels, is the necessity of combining all the parts of the animal body *in sympathy, i. e.*, for the purpose of establishing a general connexion and dependence of one part with another, and of the whole with every part. But this, I conceive, is not the whole extent of the office of the organic nerves in the present case. That they have a more *vital* influence is shown by the fact *that the tissues of the eye are disorganised and destroyed by severing its organic nerves.* The action of the heart, the propulsion of the blood through its vessels, and the peristaltic movements of the bowels, are no more than the organic actions of the eye, independent of innervation. Plants have no need of a nervous system, neither sensitive nor organic. They have no sympathies of the kind of those of animals. Their circulating vessels suffice to bring all their several parts into mutual relation. Another reason, they are immovably fixed in one spot. Deriving their nutrition by means of roots, they *receive it in one continuous current.* There are no *interruptions of supply*, as with animals. They never fast. Therefore they need

no stomach, no heart, no force-pump to propel the fluids through the vessels; the interchanges going on between the contents of the leaf and the atmosphere, promote their circulation as effectively. But it is precisely because animals fast—man and brute—because their blood-vessels are in the course of twenty-four hours in alternate states of distention and flaccidity—at least comparatively so—that they require a *regulating nervous system* to adapt the calibre of the vessels to the quantity of their contents. The blood-vessels undoubtedly contract upon their contents, and propel them forward, precisely in the same way as the heart does, as the alimentary canal does, as the bladder does, and in a great measure in consequence *of the same mechanism—reflex action.* As the *stimulus,* therefore, either of *distension* or of *quantity,* in any of these cases cited diminishes, so does the contractile action called forth by that stimulus.

P.—The nervous system, it strikes me, taken as a union of complex parts, as consisting of a supreme governing centre, that of animal life, and the subordinate ganglionic centres of nervous power attaching to special organs; with every means, moreover, of inter-communication between associated parts, for the purposes of mutual help and sympathy, may be compared to a republic of confederated states, each individually independent, but all mutually allied and co-operating for the general good.

Dr.—Your simile is *apropos* and accurate; and you have only to carry out the metaphor to see how it fares with the governed in such a government. In a time of profound calm and prosperity of these associated states (general health of the organs), each is only concerned with its own functions, and is competent to their discharge; having no special call upon its confederates for aid or sympathy. In such cases, the supreme council of the republic (the great centre of animal life) only takes cognizance of the general condition of each state (*i. e.,* organ) in particular, and of the wants of the collective body in general. But let an enemy from without (disease) find entrance; or let *intestine* tumult within threaten the dismemberment of the body political (corporeal) then their mutual sympathies and interests unite to spread the common alarm; as all share the common danger, and reap the common weal. At the same time, the presiding local centres of intelligence and power (visceral ganglia) take their measures of prevention or remedy. The energies of neighbouring parts are roused, their help evoked. By a consentaneous action of the allied powers, a

vigorous effort is made to expel the foe, or to quell the revolt. In the case of the enemy gaining the upper hand, or the rebellion flourishing (disease unsubdued), then the break up of the social (corporeal) policy and frame-work is the result. Or if, through innate strength, the *constitution* holds together, and the *forms* and functions of government are retained, nevertheless, *violence*, *dissension* and *heartburnings* long prevail at the centres of power, and *anarchy* and *weakness* at the extremities (chronic maladies supervene, through the neglect, or exasperation of acute diseases). The *subordinate* parts, untrained to office, unfit for power, often usurp the seats of *principals*, and with the usual result; viz., that abuses grow more rank, and confusion gets worse confounded. (Morbid irritability of the organs, pains, spasms, convulsions, delerium, &c., evince the perversion of the functions of the vital centres.) But this is neither the height nor the whole of the evil. It is the nature of all extraordinary efforts of bodies (corporeal or political), to weaken, to waste, to exhaust, their material resources. The general muster of the available strength of a commonwealth (putting to the test the *vis medicatrix*) can only take place at the expense of disturbing or suspending, for the time being, the various trades and professions of its members (the functions of the organs). But this interruption to individual callings, must only be of very temporary duration, and of very unfrequent recurrence. Because, if the industrial arts, tillage and commerce, are long neglected, the state must necessarily fall into decay. Private ruin, general poverty, famine, and in the train of all these, widespread DISEASE will follow. The cup of calamity is at length full; and the sense of suffering now impels to the search for remedy. But the extremity of affairs is not always favourable to coolness of reflection. At first, any expedients are caught at, on the principle of drowning men grasping at straws. This is the season for the patronage of quackery political (and professional). Changes of ministry (of doctors) are the order of the day; and all sorts of political (drug) dosings and neck-or-naught remedies (mercurial courses, iodine, strychnine, arsenic, &c.) are called for, to purge off constitutional obstructions, to operate a diversion, or to give vent to pent-up ill-humours. But all to no effect. Every new experiment of an unfitting remedy only leaves the state (the patient) in a worse plight than it found it (him). Exhausted by vain efforts, and sick of social (physical) turmoil, aches and pains and disabilities of every sort, reason at length gains the ascen-

dancy. Passion and prejudice are trampled under-foot—a "man of the people" is raised up (a "peasant-philosopher" it may be) —to teach the community *that help (health) is not to be found in agents extrinsic and alien to themselves.* The nation that will be saved, *must save itself.* Its help is from within. By living at peace among themselves (diet and regimen), and by the steady development of their own rich internal resources (the constitutional powers given free play, the *vis medicatrix naturæ* untrammelled) all former extravagances and abuses may be to a great extent redeemed, counteracted, or remedied; and the body political (and corporeal) by degrees reinstated in its pristine condition of health and vigour.

CONVERSATION EIGHTEENTH.

The relations, sympathetic connexions, and reciprocal influences of the nervous systems—Influence of irritated ganglionic centres in the production of morbid mental phenomena—Is nervous power identical with electricity?—The virtual suicide universally practised in society—The body-conscience—How it is perverted or seared—Intrusion *into the organic domain, and its results—Animal and organic sensibility—The index of being "used up"—Consequences of sound and unsound organic centres—The stomach the centre of sympathies——The consciousness of unconscious parts—"Fast" living—True and false civilisation and refinement—Reciprocal disturbances of brain and stomach—To be happy the privilege of all—The inlets of mortal woe.*

Doctor.—The general sketch of the organic and animal nervous systems, given in our last conversation, will prepare us now to discuss the subject more in detail, and with more special reference to its *practical bearings.* The topic is one equally replete with interest to practitioner and to patient. In the profound study of the relations, and reciprocal influences, of these admirable nervous structures, the practitioner, especially, will find the surest elements of sound judgment and practical acumen in the consulting-room and at the bed-side.

Patient.—The organic functions of the individual, you said, are withdrawn from the influence of the will, are performed with-

out consciousness, and yield no sensation, so that a wonderful machinery is at work day and night, in our head, spine, chest, and abdomen—without our knowledge, or without our being reminded of it.

Dr.—Yes; but this is only so long as the primitive constitution of the animal is maintained, and its laws obeyed—*i. e.*, in the state of health. Under disease, when morbid sensation is aroused in this system, by the violation of its natural sensibilities, and the Creator's ordinances imposed to guard them, the existence and actions of the stomach or heart become painfully conscious; and besides, an element of *general* misery and *malaise* is superadded, that more than aught unman's the sufferer, prostrating alike the physical and mental energies. This lesion, this *strain* of the organic nerves, lies at the foundation of hypochondriasis in every case; and is the root of insanity in probably the majority of cases. The influence of irritated ganglionic centres in the production of morbid mental phenomena, is hardly yet investigated, hardly credited, by the profession.

Although the various nervous centres are insulated masses in one sense—distinct and independent systems—yet are they all intimately associated, by indirect connexions at least. The spinal ganglions in front of the vertebræ occupy a sort of middle territory, between the nerves of *animal* and those of *organic* life, and are a medium of communication between each. First, they join filaments with the nerves going to the brain to convey sensations, or proceeding from the spine to supply the muscles of voluntary motion; notably those of respiration. Secondly, these spinal knots and nettings are connected by numerous radiating branches, with the great ganglionic centres, supplying the heart, lungs, stomach, bowels, kidneys, womb, &c.

These sympathetic connexions will sufficiently explain why disease of the viscera deranges the brain; and why cerebral irritation, in its turn, disorders the viscera.

P.—Can you determine or define precisely what nervous power is?

Dr.—The task is difficult, I must confess. Attempts have been made to identify it with electricity. There is, beyond all question, an electrical battery in the structures of man, and a current of electricity perpetually pervading these structures.

P.—*But is there not something more?*

Dr.—Undoubtedly. The whole subject, however, of vital properties is very recondite.

P.—I suppose change in the quantity or quality of the nervous influence will modify its functions?

Dr.—Yes; how this may be with the nerves of *organic life* we may infer by analogy, from what takes place in the seats of the nerves of *animal life.* Lowered mental tone, for example, the want of excitement, or disagreeable excitement of brain, lowers the voluntary functions, the nervous and the muscular energy; and then, by the sympathetic connexions, depresses visceral energy. This is seen in the readiness of soldiers, during a retreat, when the spirits are generally depressed, to take typhus fever, and other low forms of disease. It is also witnessed in the withering bodily effects of *despair;* and in the sudden rallying of the organic energies by the excitement of *hope.* The stimulus of innervation may be so lowered, *on the instant,* as to produce total prostration of power, or paralysis of function.

P.—You would illustrate this by the *shock* of sudden bad news.

Dr.—Precisely. On the other hand, it may be so intensified as to produce involuntary and convulsive action, suspension of consciousness, and death. The *kind* of nervous influence depends upon the condition of the brain. A sound and vigorous brain, exercised in conformity with the laws of man's mental and moral constitution, yields the most salutary influence in its own department and in that of the organic nerves.

P.—By the same rule, nervous power used contrariwise—*i. e.*, the lower feelings predominating over the higher, the natural order of things is inverted, and diminished mental and corporeal power will result.

Dr.—You are quite right. In any way—but most of all in a bad way—over-exercise of the mental energies robs the physical; and over-exercise of the physical robs the mental powers. Our power to pervert, exalt, or depress the functions of *the animal nervous system,* according as it is exercised in a manner at variance, or in harmony, with the conditions of its healthy action established by the Creator, is perceived and received by every one as indisputable truth. *But the analogous truth with regard to the good or bad influence we are daily exerting over the organic nervous system, is perceived and received by few. Hence, virtual suicide is daily, universally, practised in society; and men know it not, feel it not, heed it not.*

P.—Do you mean to say that all habits of action, all modes of living, all diets, and all drinks, that are not in conformity with the

organic laws of man's constitution, are *pro tanto* voluntary infringements of the first law of life, self-preservation?

Dr.—I do—and this is a startling truth to bring home to men's minds. The only difference is, that the intentional suicide does his work *at once;* the unintentional does it by *piecemeal.*

P.—You make it now clear. This enunciation of a solemn truth, for the first time, seriously arrests my attention—flashes a sort of electric light into my conscience, if I may be permitted such a figure of speech.

Dr.—I believe it will do so with every good man to whom it comes home. It should stir up profound reflections in the moralist.

P.—I am quite aware, as you have already so satisfactorily proved, that the tendencies of true philosophy, and the revelations of true science, harmonise with those of true religion.

Dr.—Here is another proof of it. Men speak of *conscience* only in reference to moral sentiments, instincts, and well-being. But there is a *corporeal conscience*, as prompt to warn of deviations from the laws of corporeal well-being. And the same analogy holds as to the *hardening effect*, or *searing process*, produced by the *habitual* violation of the sane dictates of either.

P.—I perceive it clearly. The light you have shed into the recesses of my inner man grows stronger and more searching. You have struck out a topic which it is peculiarly the physician's vocation to preach on.

Dr.—Truly said. That has long been the subject of my daily conversations. Ninety-nine in a hundred patients we see *entail their own diseases* by the systematic, albeit, oft unwitting, violation of the *sound instincts* of their body. With some unfortunates, *a healthy body-conscience has never existed;* because the process of perversion, of searing it, has commenced in their cradle, and has been continued all through. By countless multitudes thus *sophisticated*, corporeal evil is called good, and corporeal good, evil.

P.—It certainly behoves medical men to expose and oppose, with all their influence, a giant bane of this sort, which unconciously affects the core of society, and poisons the springs of life at the fountain-head. And I believe all those will do so who value the influence of their calling more than its gain; and who deem the *prevention* of disease, though less lucrative, yet more honourable than *cure.*

Dr.—A hard-judging world won't give us credit for so much

benevolence and disinterestedness. But let that pass. To our own master we stand or fall. The connexions and sympathies of the organic nervous system may become man's greatest bane or blessing, the greatest bane when the organism is abused, the greatest blessing when its laws are strictly maintained. In the natural and healthy state of the system, if any substance unfriendly to life be introduced within its boundaries, its deleterious properties soon make themselves evident.

P.—What results particularly in such a case?

Dr.—This. The organic sensibility is done violence to, more or less, and the nervous extremities convey to the nervous centres the intelligence of an ungenial and unwelcome intruder into the organism. Measures of prevention, or remedy, are taken on the instant, as a result of the consent between the extremities and the centres of power. A copious secretion is poured out to wash away, absorb, or drown the noxious irritant, and at the same time to shield the delicate tunics it is brought in contact with.

P.—What, if these be insufficient, and still more violent measures of vital protection are called for, by the interests of the economy—what then?

Dr.—In exact proportion to the unfitness of the disturbing agent for vital purposes, is the discomfort it creates to the presiding central powers, and the measure of resistance it meets with. The sympathies of neighbouring and allied parts are roused; and an united effort is made against the intruder. He is either expelled the forbidden ground, by a consentaneous action upward of the muscles of the stomach, diaphragm, chest, and abdomen (vomiting); or, if gone too far to return, a summary exit is enforced per descensum.

P.—That, I suppose, you would say was the view nature takes of aperient pills and purgative draughts, and other delicate compounds of the same character.

Dr.—Yes; of all drugs in any dose to be sensibly felt. In the unperverted organism, these conservative actions have all the unerring certainty of instinct, and all the method and precision of reason.

P.—You would say, then, that an unsophisticated palate abhors alcohol, opium, tobacco, as much as nauseous drugs, and for the same reason, because innately poisonous?

Dr.—Certainly. By such a palate a genial substance, as bread, fruit, &c., is highly relished; and the more natural it is, the more

highly relished; plain cooked meat, for example, is more piquant than ragouts, devilled and sauced dishes, &c.; the bread of unbolted wheat than that of finely-sifted flour.

P.—What distinction do you draw between *animal* and *organic sensibility?*

Dr.—*Animal sensibility* is needed in reference to the corporeal wants. It is represented by, or summed up in, the five senses. These constitute the faculties of external relationship, *i. e.*, they intimate to the regulating animal centre, the qualities of external objects, their size, temperature, roughness, or smoothness, softness or hardness, dryness or moisture, nearness or distance, taste or smell, position, &c., &c. They are established to guard the body from sources of injury that lie without, or lurk in the things taken within.

P.—Have the *nerves of organic life* any sensibility of this sort?

Dr.—No! not in the state of health. But they have the precise co-relative and equivalents. Each organ under their control possesses an organic sensibility of its own, as faithful, true, and delicate *in its sphere*, in testing the qualities of the things it is constituted to take cognisance of, as is the ear to sounds, the eye to colours, the nose to odours. *This organic sensibility constitutes the conscience of each organ*, we have spoken of above. *This is its special sense.*

P.—It is in consequence of this special sense, you make it appear, that the nerves of organic life transmit to their centres, the impressions made upon them by the substances contained in the organs to which they are distributed.

Dr.—Just so: that is sound doctrine. This sensibility varies in kind and intensity, according to the nature and action of each organ, as any given organ has been used or abused, and according to the unfitness or the vital wants of the object that elicits its action. The lungs, for example, are constituted quick to perceive the qualities of air; the stomach those of food; the bowels those of chyme; the biliary organs those of bile; the bladder to perceive the qualities, irritant or otherwise, of urine; the heart and blood-vessels the qualities of the circulating fluid, &c.

P.—I may put this down, then, as an ultimate *fact* or *law* in physiology, viz., *the adaptation of the special nerves of special organs to discern the properties of that which concerns their functions.*

DR.—A very clear law, the *final cause* of which is sufficiently clear; but into the efficient cause of which it would be as vain to inquire, as into that of gravitation. The only answer is, *So* the FIAT of the Creator made it. This law of their nature *is the sentinel of each structure and organ, their safeguard against whatever is inappropriate or injurious.*

P.—Against all violence and offence to the organs they supply, these nerves recoil and protest, as one might say.

DR.—As you may say, truly, although metaphorically. Nor is their protest unheeded and unregistered at the organic head-quarters. By the same law that implanted this conservative instinct, it is appointed, *that all injury*—wilful or unwitting, it matters not—*is followed by irritation and derangement of function, in the precise measure of the offence.*

P.—Would you say that incorrigible offence is followed by irremediable disease?

DR.—I do maintain it by abundant and unmistakeable proofs. What leads to these deplorable results is this, that as the *moral sensibilities* of the individual—the conscience proper—may be perverted, even deadened; so may be the *organic conscience,—the physical sensibilities set to guard special functions*—be perverted or destroyed. Only conceive this state of matters, the man given up a willing victim to self-destruction, knowing it not, perhaps intending it not; but, worst of all, usually heeding it not, as we see exemplified in the case of the inveterate drunkard or opium-eater, *quite indifferent to it.* It is a singular fact, also, that the two deteriorating processes generally go together—the one inducing the other.

P.—It appears, then, by your clear showing of your case, that as the most hopeless state of the *man moral*, is that in which the moral sensibility is quenched; so the most deplorable state of the *man physical*, is that in which his natural organic sensibilities are falsified or obtunded.

DR.—Precisely. *The state of the organic nerves, accompanying chronic disease, is to the observant physician the surest index, in a multitude of cases, of the sort of life the patient has led; how far he is "used-up;" what hope there remains for him; the precise cast of his future days, and the probable time of their termination.*

In the department of *organic life* the sympathetic relations are intimate, intense, universal. It is the reverse in the province of

animal life, so far as mere animal functions are concerned. A limb may be cut off, an eye destroyed, without impairing the integrity of the other eye, or other limbs, or affecting the health, *if the vital organic centres and viscera be sound.* Not if otherwise. From sound organic centres, a healthful influence is transmitted to every part of the organism, and this greatly through the route of the organic nerves, ramified on the blood-vessels.

P.—What if the vital centres be unsound, irritated, or debilitated?

Dr.—Then the morbid influence extends wherever an organic nerve goes, that is, throughout the entire economy. In such case, all injuries of the circumference or extremities of the body sympathise intimately with the unhealthy state of the centre; and all acute diseases, not intense enough to extinguish life, become chronic, *persistent in character, though subdued in tone.* Under this morbid influence of the organic centres, a broken bone will not unite; or what would be in a healthy man a simple inflammation from a wound, becomes erysipelatous, phagedenic, ending in mortification, or producing a fatal fever. In this unhealthy condition of the body, a simple inflammation of the eye, or of the gums, will run on to ulceration and destruction.

P.—I suppose that the degree of sympathetic influence which each organ has on the others, is always in proportion to the rank that organ holds in the system.

Dr.—Yes, according to its functional pre-eminence. The stomach *stands first in this sympathetic scale;* and justifiably so on every ground. Connected as this primary organ is, on the one hand, with the great centres of *organic* life, associated by plexuses (nervous nettings) with all the other nutritive viscera, heart, lungs, liver, kidneys, &c.; on the other hand inter-communicating, as it does, with the grand *animal* centres, by means of the par vagum, or pneumo-gastric nerve, and ever irritated in man's artificial state by his ever recurring wants, the sympathies of the stomach must necessarily be, and *are*, of all others the most profound, direct, and universal. *The suffering of every other organ is reverberated back upon it, and its sufferings in turn are reflected back on every other organ.*

P.—This explains the well known fact that a blow on the stomach will more speedily extinguish life than a knock on the head.

Dr.—It does. In boxing, for this reason, it is not permitted to hit below the waist. A sudden and acute irritation of the organic

nerves of the stomach, as from inflammation, spasm, or even a simple flow of bile into its cavity, will often produce entire prostration of the muscular powers, with deadly pallor, and all the feelings of dying. The stomach *in its rage*, when highly offended, oppressed, and irritated beyond endurance, will cause the brain to beat till real fury or phrensy is produced, sometimes till the structure is torn, and the man falls like a felled ox. Very few I have met with thoroughly appreciate the pathological condition. A reflecting physiologist who had suffered in days of yore, *like myself*, from dyspepsia and headache would be more clairvoyant on the subject.

P.—From all this I should infer that the complete functional integrity of the organic viscera depends on the healthy condition of the nerves supplying them.

Dr.—Undoubtedly. The organic sensibility of health is exquisite. By corporeal abuses, by the repetition of disturbing causes, the natural organic sensibility of the part becomes denaturalised and depraved. Morbid irritability is kindled up; morbid sensibility accompanies it. The irritating cause is reiterated, and morbid irritability and sensibility are permanently established. The result is, that from this starting point diseased sympathies are propagated throughout the economy. Hence all the functions of organic life are necessarily impaired, and impaired just in proportion to the amount of the morbid irritation.

P.—That stands to sense. One compartment of a complex mechanism cannot go wrong, without the play of every associated part being correspondingly deranged.

Dr.—In the human organism, for example, by a primary point of irritation established in the stomach, lungs, heart, or brain, every function becomes gradually to be more or less impaired. Digestion languishes. The chyle is badly elaborated. The blood deteriorates. Respiration is imperfect. The circulation is partial, irregular, unequable. The vital operations from being an easy, *unconscious labour*, become a painful struggle. Increasing inflammation or congestion in the centres of organic life, developes increasing local and general malaise, in which the animal centres sympathise. *Patients get to feel the operations of their own stomachs, and the movements of the blood through the heart and great vessels; with often a painful consciousness of the existence of a brain.*

P.—This consciousness in unconscious parts is a deplorable state of the man physical.

Dr.—And you might add—which no strength of the man, spiritual or intellectual, can long contend against. Such a state constitutes the acmé of mortal misery, and is often witnessed in the great, the good, the gifted, *who have made haste to be eminent*, —and who have achieved their elevation by the culture of intellect, *pursued in violation of the laws of health.* The names of such victims in the annals of literature, science, and art, are *legion.*

P.—Is this abnormal sensitiveness, or morbid sensibility, of the nerves of organic life, confined to the great and the gifted?

Dr.—By no means. Two other classes partake of it:—first, those who have been slowly poisoned by courses of medicine; and second, the degraded and the sensual, who have systematically poisoned themselves by alcoholic drinks; and who, under their excitement, draw upon the corporeal energies of a month, to sustain the debaucheries of a day.

P.—In the state of *perfect* health, I suppose, there is no consciousness of any internal organs,—nothing but a general feeling of physical *bien être.*

Dr.—With corporeal harmony, and that the natural result of the perfect play of the machine, there is a certain feeling of psychical happiness always associated—mental ease, calm, and joy, to a great extent, whatever may be the external state or troubles of the individual. "I am *still* happy in my mind," said a *healthy* friend to me, who had suffered losses, and experienced vexations and troubles enough to have killed any ordinary person.

P.—I may lay this down, then, as a sure principle, that, in the perfect state of health, there are no corporeal sensations, save those of the body's natural wants; as those of food, drink, and air.

Dr.—We must include also those of the voluntary excretions.

In probably ninety in a hundred cases of CHRONIC DISEASE, *the diversity of aches and pains belonging thereto*, may be traced to and found to be, neuralgic sympathies with some morbid part of the alimentary canal: as the organ with most sympathies, and the most sinned against by the reasoning animal *par excellence!* Dietetic offences are the more heavily visited, inasmuch as they are most frequently committed, *under corporeal condition the least of all calculated to permit or sustain them*, that is, under the *over-excited* or aching heads and hearts, produced *in every class* by the competitions and collisions of modern society.

P.—So dearly do we pay for a high state of civilisation!

Dr.—*Pardon.* You are mistaken. *A truly high state* of civilisation would correct all these evils. We are refined in manners and the *conventionalities* of society. We are great in commerce, great in arts, great in arms, and great in science *theoretically, and so far as regards its money-making applications;* but in that knowledge that truly exalteth a people, and ennobleth human nature—that brings man in conformity with the moral and material laws of Deity; and which crowns his existence with that health, wealth, happiness, and length of days, the Creator *has permitted to be man's portion or privilege on earth;* in such knowledge, in such true civilisation and refinement, *we are yet far far behind.*

P.—Certainly something must be materially wrong in that alleged refinement of an age, when the vast body of the people can only obtain the *means* of subsistence by sacrificing the *end* of existence. But is not this verging upon politics?

Dr.—By no means. We are propounding no political theories; but are merely stating undeniable facts, in order to show their bearings professionally. For example; it much concerns mankind to know how that stomach diseases, and then, next in frequency to them, brain or nervous diseases prevail, as the result of a high state of false social refinement—of that false refinement whose prominent characteristics are, 1st, discontent with position: 2nd, the exaggerated estimate of the happiness derivable from wealth and station, and the helter-skelter race to attain them. The *brain* and *stomach* are here the battledores that make the body the shuttlecock of mortal miseries—*irritation* being banded about from one to the other, in proportion as now the one, now the other, is vexed and maltreated. With many, there is little intermission of actual or sympathetic disturbance in either organ; *and life is one long disturbance and disease.* In these reciprocal disturbances of brain and stomach, we have all degrees of suffering—from low spirits to ill temper—from convulsions to insane ravings—from hypochondriasis to idiotcy—from palsy to epilepsy—from the tedious softening of the brain, to the sudden apoplectic fit.

P.—I must say, you have opened to me a field of great physiological and pathological interest; one whose cultivation by the community at large would yield the most precious fruits.

Dr.—A volume might easily be written on the influence of the nerves of organic life on the animal functions; *i. e.* on the manifestations of mind, thought, temper, passion, disposition, character, &c. Here we can strike out only the most salient points.

In the perfect health of the organic nervous system, when the instinctive wants of the organism are satisfied, when the viscera receive none but their appropriate *stimuli*—proper air, food, chyle, blood, &c.—the whole machine works smoothly, harmoniously, joyously. A general feeling of *bien être* pervades the frame, with an entire absence of any special *local* sensations, or interior organic consciousness. The mind feels a cheering exhilaration, but does not know its source—at least, heeds it not. The thoughts flow easily; the fancy warms; and the highest aspirations of the man kindle.

P.—That is a proof that no law of our constitution has been materially violated.

Dr.—It is. This serenity of mind and physical joyance would be man's habitual state, if all the laws of his constitution, mental, moral, and material, were systematically observed.

P.—The reverse, alas! is the common picture of human nature and of human life.

Dr.—That is man's fault or misfortune. The Creator has made all provision for human happiness. Wherever there is suffering of any sort, be sure that there has been departure from the established laws of man's constitution, in some point or other. The first step to the remedy of an evil *is the ascertainment of its source.* This corrected, warning taken, relapse avoided, health may be preserved and life prolonged, and the gates of happiness opened to all mankind. Moral causes may give temporary pain, grief will inflict its sting, and sorrow cloud the brow—vexations, crosses, and losses must be expected long to be mortals' lot; but their impression on the perfect organisation of the *healthy* man, will be as the ruffle of the summer breeze on the placid lake. "Weeping may endure for a night; but joy cometh in the morning."

Irritability in children or adults, is a sure proof that the organic nervous centres have been irritated in some shape or other; yet the mind is unconscious that it sympathises with the body. The brain is irritated by stomach-irritation as a result of its nervous connexions; and it irritates the stomach in its turn, when irritated in itself by the undue exercise of its own functions. The emotions and passions too long and too frequently indulged—grief and fear, jealousy and anger, love and pleasure—disturb the functions, and injure the structure, of both the organic and animal nervous centres. Hence the functions of the stomach are most impaired by profound mental emotions and exercises.

P.—Does it not occur, also, that the action of the heart is sometimes *almost*, and occasionally *altogether*, suspended by vehement moods of mind or thrilling sensations?

Dr.—Yes; sudden death often follows sudden joy, or excessive anger. The effect of over straining, or over exciting, any function is to exhaust its nervous endowments faster than they flow into it, or are created. Impairment of structure necessarily follows all undue *exertion* or demands on *function*. In this way, morbid action in an organ is *fixed*, its operation impeded, and its sensibilities perverted. From such a starting-point, morbid irritation is propagated throughout the economy, and a universal morbid sympathy is set up.

P.—It appears, then, as the conclusion of this whole matter, that the stomach and the brain, as being the centres of nervous power—in consequence of their connexions, deeply reciprocating and resenting each other's trials, injuries, and complaints, and being, moreover, the organs that are constantly over-worked and over-excited by the habits of society—on these grounds, I say, it appears that *the stomach and the brain are the inlets of all the woe that our world presents.*

Dr.—A melancholy fact in natural history. Yet a radiant gleam of hope shoots out around the thick darkness. *Knowledge in due time will correct these evils.* It is something to unfold their source. Whoever shall comprehend thoroughly the morbid states of the stomach apparatus and brain, and *shall trace accurately the steps that led to their disordered action*, shall have in his hands the two keys that will unlock all the secret chambers of *chronic disease*, and will possess a clue whereby to unravel all the intricate windings of its symptoms.

CONVERSATION NINETEENTH.

The generalities of the function of nutrition or assimilation—Cells absorb the organic compounds floating in the blood, and metamorphose them into structure—Changes of nutrition and its products lie at the foundation of all diseases—Natural and morbid affinities of the structure—The humoral pathology—Morbid products or deposits in the blood—The functional activity of a part the measure of its nutrition—Hypertrophy and Atrophy—Their causes.

Patient.—What do you call assimilation?

DOCTOR.—That function or process by which dead alimentary matters are converted into living organised structures (literally *made like* them).

P.—What is the essence or essential of the nutritive act?

DR.—*The growth of the individual cells comprising the fabric.* This commences while the inert nutritive materials are in their fluid condition, while they are circulating in the vessels. These cells draw their nourishment from the organic compounds floating in the blood.

P.—In the same way, I suppose, as plants derive their materials of growth from inorganic matters diffused in the air or in the water they absorb?

DR.—Precisely so. These materials are selected in such ways, and combined in such proportions, as to produce all the diversified forms and characteristic properties of organised structure, vegetable and animal. Each separate tissue of the body has its own peculiar and distinctive affinity for those constituents of the blood that are fit to be appropriated to its own uses, and converted into its own substance. Thus are matters previously inert and without life transformed into living fabric.

P.—I suppose this property of *cells* to convert matter into its own structure is an ultimate *fact* or *law* of physiology?

DR.—Yes; like that of chemical affinity, gravitation, &c., not to be explained. It has been already shown how cells grow from germs, mature, decay, or give up their contents, leaving behind them germs to go through, in their turn, the same round of reproduction and decay. This property of a cell, or structure, constitutes its *vitality*, a name to designate it as something entirely diverse from a *physical* or *chemical* property. As far as we know, it is beyond the power of inorganic matter to constitute a CELL. The simplest cell must have a previously existing cell to furnish the germ.

P.—The definition of a *cell*, according to this, is, nature's *vitalising*, *organising* apparatus, by which it draws from the blood the materials required for the development of the structure it appertains to.

DR.—Just so. From this it will be apparent how substances abnormally present in the blood, must necessarily deteriorate the condition and development of the cells, and the solid tissues they originate. The tendency of all foreign or unnatural substances, of poisonous drugs, of effete or inert elements in the blood, is to produce a state of irritation in some or another solid tissue of the

body; to disorder its nutrition, and to make it, in fact, a focus or starting-point of diseased action.

P.—Do I then clearly understand you to say *that changes in the activity of the nutritive processes, and in the character of their products, changes either affecting individual parts or the entire organism, lie at the foundation of all diseases?*

Dr.—That is precisely the doctrine I inculcate; further, every tissue has its own morbid, as well as natural affinities in tendency to draw to itself and to retain or let off certain elements of disease or foreign unassimilable substances in preference to others. Drugs are among the foreign substances the system is gratuitously taxed to dispose of. They remarkably call forth cell-affinities. Thus we find one tissue or organ has an affinity for *arsenic;* another for *lead;* a third for *copper;* a fourth for silver; a fifth for gold; a sixth for iodine; a seventh for *mercury;* an eighth for *aloes;* a ninth for foxglove; a tenth for ergot; an eleventh for colchicum, and so on.

P.—The humoral pathology, then, holds an important place, and is not to be so thoroughly discarded as some would suppose?

Dr.—Discarded? no! The whole tendencies of microscopic physiology, and of animal chemistry, point in that direction; in fact, place the humoral pathology on a firmer basis than ever, though not so vague and exclusive as of old. The primary alteration of the secretions effected by disease, their excess, defect, or perversion, of course alters the constitution of the circulating fluids, either through the non-elimination of effete matters, or by the formation of morbid products. Hence abnormal elements or deposits in the blood are the percursors and attendants of every functional or structural change that can occur, constitute, in fact, the material palpable causes or conditions of the persistence of diseased action. This can be *demonstrated* in a great many cases.

P.—You have just referred to the chief sources of abnormal elements or deposits in the blood; sum these up, if you please.

Dr.—They are *three*, perhaps. 1st. Disordered conditions of digestion and assimilation; the unhealthy elaboration of healthy materials; in other words, the making of bad blood. 2nd. Extraneous or abnormal matters introduced from without, as alcohol, drug-poisons, &c. 3rd. Arrested, excessive, or perverted secretions. The non-elimination of the wasted fabrics of the body, being the means of accumulating in the system the largest amount of the most deadly elements of disease.

P.—All these active causes of abnormal elements or morbid products in the blood, must still further vitiate the nutritive processes?

Dr.—Clearly; by presenting to the cells unfit, injurious, or extraneous materials, *out of which to build anew the constantly decaying tissues.* Hence will result two grand evils: 1st. An acceleration or retardation of the normal nutritive processes. 2nd. A deterioration of the character of their products. From these will result, more or less, malaise and debility.

P.—I see clearly your doctrine. We cannot have disease affecting any individual parts, or the entire organism, without these essential elements and concomitants. I foresee, from this, the successful defence you will set up of the pretensions of the water-cure; inasmuch as Hydropathy is confessed to be the grand, unrivalled opener of the excretory outlets of the body; scouring out of the corporeal canals, channels, and reservoirs, all morbid *débris* that offend and poison the life-springs.

Dr.—Also by giving tone and power to the nervous centres, and healthy condition to the solids; but we shall come to that on another occasion. I believe that never before had a system such scientific buttresses and bulwarks, as the water-cure has. But that does not concern us at present. I was going to remark that the functional activity of a part, or of the organism generally, is the measure of the amount and rapidity of its nutrition. Health consists in, or is maintained by, the due proportion being observed between the activity of the *nutritive processes*, and the amount or rapidity of *waste*, according to the demands of the body under the varying conditions of infancy, youth, maturity, decline, decay, labour, and rest, &c.

P.—Hypertrophy and atrophy indicate relative degrees of nutrition, its excess or its defect?

Dr.—Exactly; the former is nutrition exceeding waste, the latter waste exceeding nutrition, in the whole, or in a part of the body.

P.—Does increased nutrition necessarily follow increased ingestion, or excessive supply of food?

Dr.—No, emphatically. This surplus, indeed, if digested, may render the blood richer in nutritive materials; *but it does not induce augmented plastic activity in the tissues, by which these nutritive materials are made part and parcel of the living fabric.* These materials, therefore, being in excess in the system, over and

above its wants, or its power of appropriation, impose a gratuitous burden on the excretories—necessitating the extra exertions of the latter, to rid the system of the undue accumulation of the former. But the excretories as often fail of their activity, as the plastic processes, or, at all events, break down under the abnormal efforts thus demanded of them.

P.—I see, then, there is no help for it, but that these unassimilated, unexcreted materials, become a pregnant source of disease, become, to all intents and purposes, foreign, unconformable, uncongenial elements, a true *materies morbi*, as you designate it.

Dr.—I perceive you properly apprehend the foundations of the Humoral Pathology. If even the excretories do succeed in eliminating this excess of materials, which they will do for a time in unimpaired constitutions, yet this extra strain of their powers eventually exhausts their energy, impairs their functions, and finally degenerates their structure.

P.—But is not *fat* a provision of nature for storing away this excess of nutritive materials?

Dr.—You are quite right. Adipose or fatty tissue is an expedient of nature to remove from the circulating current an excess of nutritive materials, beyond what the system has been able to appropriate to the actual wants of structure. The undue nutrition of this tissue is the least injurious form of hypertrophy.

P.—How is hypertrophy or excessive nutrition of a part usually induced?

Dr.—This is anticipating our pathological conversations. But I will briefly satisfy your inquiries as they are *apropos* to the subject of nutrition.

1st. The excessive use of a muscular part (whether it be an organ of voluntary or involuntary motion), will induce therein hypertrophy or undue development. This is witnessed in the heart in cases of pulmonary obstructions, from the excessive efforts to clear that obstruction; in the bladder in cases of diseased prostate, from similar efforts for similar ends; in the brain, occasionally, from precocious talents unwisely goaded on. In this case the soft parts grow faster than the bony covering.

2nd. By local congestions, *i. e.*, by the gorging of the distensible veins of a part.

3rd. By the oozing out of plastic elements (as fibrine), which consolidate, and become interstitial or areolar tissue.

P.—What are the causes of atrophy, on the other hand?

Dr.—These are more various. Atrophy may arise 1st. from insufficient supply of nutriment—*i. e.*, from deficient vital-sustaining power in the fibrine and plastic elements of the blood; or from a new growth absorbing the nutritive materials.

2nd. *From disordered digestion.*

3rd. From defective assimilation of proper plastic elements; in other words, from inactivity of the formation processes, from slowness of vital elaboration in the cells.

4th. From the suspension of the functional activity of a part; as in the uterus after child-birth; in the mammæ after lactation.

5th. From abnormal rapidity of disintegration; as in marasmus (wasting); diabetes; diarrhœa; cholera; starvation; fevers; and all diseases of exhaustion; from trouble, grief, care, anxiety, want of rest, excessive toil, &c.

6th. From mechanical causes, *e. g.*, obstructed circulation; from ossification; from inflammatory deposits obliterating the arterial tubes.

P.—I draw several conclusions from the foregoing observations. It seems *every vital act of the economy involves an act of nutrition.*

Dr.—It does. The vital properties of a part depend on its nutrition. The nutrition of a part, in its turn, *depends on the due exercise of its vital properties.*

P.—*The process of repair in a destroyed structure is nothing new or abnormal.*

Dr.—True. It is simply the carrying out of the peculiar cell-formation, or nutritive processes belonging to that part. But let me add two other inferences for you, which I have, perhaps, scarcely afforded you the data for drawing.

Abnormal growths, as tubercle, cancer, &c., are instances of disordered nutrition, perverted cell-development.

Death is the final cessation of nutritive effort—the arrest of all cell-mutations. This, however, is anticipating our Pathology, in which department we will discuss at length the important bearings of these and their allied topics.

CONVERSATION TWENTIETH.

Of the circulation of the blood; and of the moving powers concerned therein.

DOCTOR.—TO-DAY, following the due course of our scientific colloquies, I should, by rights, enter on the functions of DIGESTION, ABSORPTION, and SANGUIFICATION. But this topic is so comprehensive, so intimately bears on our hygienic practice, and is, moreover, so full of interesting details, that I reserve it for a special series of conversations, which shall include the subjects of DIET and REGIMEN. (See Part IV.)

PATIENT.—Well, you could not discuss anything more interesting than the circulation of the blood. For I know enough of physiology to know that on the equable, uniform, and continuous movement of the nutritive fluid through the blood-vessel system, the healthy action of all parts of the vital economy depends.

DR.—True. There are two distinct and entirely separate circles described by the circulation. 1st, that through the lungs; 2nd, that through the general system. The heart is placed at the junction of these and is a double organ,—two hearts joined together as it were—each circulating system having its own heart, its own arteries, and its own veins, intrinsically or anatomically independent; but, in fact and in function, intimately blending with each other in their common centre, and at their common extremities.

P.—I suppose the heart has the action of a great force-pump?

DR.—Something of that sort. The *outward* movement of the blood—*i. e.*, through the arterial trunks and capillaries—hair-like tubes, the ultimate branches of the circulation—is performed principally by the propulsive action of the heart, and partly by the contractility or elasticity of the smaller vessels. The larger vessels have in their structure a preponderance of *elastic tissue*, a great purpose of which is to make the *intermitting* waves of the blood, sent by the pulsations of the heart, into one continuous unbroken current.

P.—Have the capillaries any muscular tissue in their coats?

DR.—No. But there are supplementary local forces, which regulate the flow of the blood in the capillaries, independently of any central impulsion, or contractile action in their own coats. Seen through the microscope, the capillaries present no obvious

movement. The stream from the arteries passes through them, as through inelastic tubes. *They do not afford any mechanical assistance to the movements of the blood.* Their coats are indeed contractile. But this is merely to regulate their calibre, and not for the purpose of peristaltic movement—the movement alone that would aid circulation. *The great agent in the flow of blood through the capillaries is the chemico-vital reaction that takes place between the fluids they hold, and the tissues they nourish.*

P.—*The maintenance, therefore, of the proper chemical constitution of the blood, I infer, is the grand condition of the healthy capillary circulation.*

Dr.—It is, subject however, to the influence of the nervous system. Hence imperfectly arterialised blood, or blood containing morbid elements induced by faults of nutrition or secretion, or introduced by direct poisons taken into the stomach, or by miasmata through the lungs,—blood altered in any of these ways in its due chemical condition and affinities, will disturb the capillary circulation—will favour visceral congestion.

P.—Your doctrine then goes to prove, or to make it highly probable, that interior congestions are an essential element, or an inseparable condition, of all chronic and acute diseases?

Dr.—That to me is very clear. You may truly say that congestion, in some degree or other, in some quarter or other, is the *material* cause or condition of all diseases; for whether it be an effect itself of a primary mischief, an irritant applied, a poison imbibed, or a miasm inhaled, it soon establishes itself as virtually the *efficient* or *perpetuating* cause of the malady.

Hence lay it down as an irrefragable axiom, *that the removal of congestions, or the promotion of a perfect capillary circulation in vital or other organs, where it has been languid or arrested—and thereupon the liberation of the secretions and the regulation of nutrition, the restoration of the mechanical constitution of the blood are the grand practical indications, aims, and accomplished results of* CURE.

P.—Have not these been in essence and effect the object of all medicinal systems in all past times?

Dr.—In *theory* they may be said to have been the aims of some of the really reflecting practitioners of all times and of all sects. But *practically* they often hardly knew what they aimed at—at least the *means* they used were the most irrational and unlikely for their *ends.* *The best system of medical treatment—by whatever*

name it may be called—is that which will best accomplish these great ends. What claims to this *beau ideal* of curative art, the agencies comprised in THE WATER-CURE may establish, will afterwards be inquired into.

P.—Will you proceed then with the main subject, for these last remarks are a digression somewhat from the business in hand?

DR.—In the great, or systemic circulation, the affinities of arterial blood for the tissues is greater than that of venous blood.

Every distinct organ attracts to itself the peculiar substances which it requires as the materials of its nutrition. In each individual case the affinities differ. The tissue of each gland, for example, possesses a peculiar affinity for those materials which it is intended to separate from the blood. As the blood, therefore, in its course gives up its elements, its affinities diminish, and it is propelled by the force of the fresh current from behind, which has not yet parted with its elements, whose affinities are not satisfied.

P.—These ingredients, therefore, hasten towards the tissues for which they have attraction, because charged with certain constituents necessary to them?

DR.—Just so; and thus the nutrient elements of the blood are gradually yielded up, in performing the rounds of the arterial circulation. The exhausted nutritive fluids then return, charged with the effete, or used up elements they have received, in exchange for what they parted with (the venous circulation).

P.—From the analogy of the action of the leaf (the lung and skin of plants) in promoting the circulation, I imagine that pulmonary and cutaneous transpiration cannot be omitted as great subsidiary agents in effecting the circulation of the blood?

DR.—Your analogical argument is valid; its conclusion just. *The exhalation or dissipation of fluids from the surface occasions a demand from below, a molimen or determination of fluids from the interior* outwards. In this way circulation is solicited and propagated from the innermost recesses of the organism. *With the checking of exhalation, either in plants or animals, this influx of fluids from the centre to the surface is checked, circulation is retarded, or is supended.*

P.—Thus, by the very necessities of waste and supply, and by the wondrous apparatus adapted by nature with consummate skill to these ends, is the circulation of the blood incessantly maintained.

DR.—It is just so. In the little, or pulmonary circulation, the

same principle holds good, but operates in a reverse direction. Here the venous blood, having the greater affinity for the oxygen of the air, drives on the arterial blood before it.

P.—Pray, what is the office of the capillary or hair-like vessels, of which so much mention is made? Are they mere conduit-pipes?

Dr.—They are much more. You may call them nature's laboratory, if you like, the sanctuary of her secret mystic processes, wherein and whereby are determined the vital laws and actions, the composition and form of the various structures of the body. Every soft animal structure may be analysed into a congeries of cells, capillaries, and nerves, bound together with areolar tissue. By means of this exquisite mechanism are performed repair and waste, secretion and excretion, the preparation and putting down of the new materials of the corporeal fabric, and the removal of the old. Of these changes, the blood is at once the *medium* and the *stimulus*, and the *organic nervous system at least a regulating power*. So much at all events is certain, that the diameter of the vessels is directly under the control of the organic nerves.

P.—It would be indeed very strange to common sense if the curious net-work of organic nerves, which you state encircles the capillaries, was placed there by all-creative wisdom for any trivial ends.

Dr.—It cannot be supposed. But to conclude this conversation, and to sum up the various and combined agencies effecting the *incoming* circulation of the blood, and its return through the veins to the heart: 1st, in part the suction-power of the heart; 2nd, the vacancy created in the chest by the respiratory movements; 3rd, the action of the muscles upon the venous trunks; 4th, the transpiration ever taking place through the pulmonary and cutaneous surfaces; lastly, the attractions subsisting between the nutritive fluids and the walls of the vessels. The veins contain two or three times as much blood as the arteries; consequently the circulation in them is slow in the inverse ratio.

CONVERSATION TWENTY-FIRST.

Of the functions of Respiration.

Doctor.—In the rounds of the circulation, as we showed in our last conversation, the nutritive fluid yields to the tissues its most important elements, to supply the demands of growth or waste; and receives into its current for removal those materials that have served their purpose in the economy.

Patient.—I believe it is the office of the excretory organs to separate these worn-out particles?

Dr.—Yes; and as this *débris* of the system is great in quantity, and deleterious in quality, a high degree of importance necessarily attaches to the functions set apart to this work of separation.

P.—I can conceive that readily, from what you formerly stated regarding the perpetual rusting or wearing away of organic as well as inorganic matter—that every vital movement of our bodies was an act of disintegration of structure, a displacement, and new combination of its atoms.

Dr.—So it is. Of this structural metamorphosis the chief product is *carbonic acid*, the carbon of the tissues being united with the oxygen of the atmosphere conveyed in the blood. After death decomposition is more rapid both in plants and animals. In all diseases, wherever decay is faster than renovation, the dark blood indicates the excess of this poisonous substance in the system. In the state of health, it is of all excretory products, at once the most copious and the most baneful. The softness of the animal tissues, their abundance of fluid constituents, the high temperature of the warm-blooded species, with the frequent and prolonged calls upon their muscular and nervous systems, are all circumstances which favour this kind of decomposition.

P.—I suppose, then, you will find the provision made for the elimination of carbonic acid to be commensurate with the need for it?

Dr.—We do. The apparatus appropriated to this end is at once the largest and most simple of any belonging to the higher animals. All that is requisite is the exposure of the blood to the influence of the atmospheric air, through the medium of a membrane that shall admit the diffusion of gases. By this simple contrivance, the exit of the most deadly material in the body and the

entrance of its most vital elements, are accomplished at one and the same time by one and the same means. In these two conjoint processes lie the great purifying and vitalising functions of the lungs. In these respects, it will be seen that the skin is a true aërating or respiratory organ, supplementary to that of the lungs. The atmosphere will redden livid blood in the cutaneous capillaries.

P.—I presume, then, that in the case of obstruction to the due action of the lungs, the exhalation through the skin will increase?

Dr.—It does, and this strictly according to the analogy of the vicarious action of other excretory organs. This is the explanation of the great advantages usually derived in pulmonary diseases from a *judicious* application of the water-cure treatment; powerfully promoting, as it does, the activity of the cutaneous functions, &c.

P.—Is not the function of calorification dependent on that of respiration?

P.—It is. With admirable economy of material and mechanism, nature has made this purifying process subservient to another of equal importance, the maintenance of *animal heat*, that is, when the direct conversion of the carbon of the food, contained in the unassimilated blood, fails to supply the heat necessary. On the other hand, when the waste of the tissues is great, the latter source may suffice for the maintenance of the required temperature, without recourse to the combustion of the materials of the food. The interchange, also, of the gases, between the air and the blood, through the skin, keeps up the temperature in the human body.

P.—You said, when speaking of the skin and mucous membranes, that the lining of the lungs, like that of the bowels, was a prolongation of the external coverings?

Dr.—It is identical in structure, and fitted by its soft, thin, porous, vascular nature, to bring the blood into close relation with the surrounding medium. The blood is distributed in a minute capillary net-work spread in the walls of the pulmonary vesicles, or cells; chambers so minute that near 18,000 are grouped around the extremity of each air-tube, making, in all, some 600 millions. The smaller air-tubes possess a degree of muscular contractility which is readily excitable through morbid action of their nerves.

P.—I suppose you would say that *spasm* was an instance of this morbid muscular irritability of the air-tubes?

Dr.—Yes; as illustrated in one form of Asthma (spasmodic), and probably, also, in the disease called Angina Pectoris. In the *trachea* and larger *bronchi*, the cartilaginous rings prevent

diminution of their calibre. This contractility is diminished by vegetable narcotics, as stramonium and belladonna.

P.—Are the lungs active or passive in the movements of respiration?

Dr.—Passive; the vacuum produced by the dilatation of the thorax, causing the rush of air down the tubes and through the lungs. This dilatation of the chest during inspiration is chiefly effected by the contractions of the diaphragm; from the previous high arch it becomes a plane. Expiration is brought about by the contraction of the abdominal muscles, which force up the diaphragm by their pressure on the viscera, and depress the ribs. These movements are aided by certain muscles attached to the spine, as you will easily perceive when observing a person under laborious breathing.

P.—What is the average numerical relation of the respiratory movements to the pulsations of the heart, and the average amount of air at each inspiration?

Dr.—About one to five or four and a half. When this standard is departed from, there is either nervous or chest disease. Twenty cubic inches is the average amount of air inhaled at each inspiration. The quantity of oxygen absorbed exceeds that given off (in carbonic acid) by 174 parts in every 1,000.

P.—Is the whole of this oxygen taken up to make carbonic acid?

Dr.—No. A part equal to one-sixth of the quantity so consumed remains for other purposes; part of it to combine with hydrogen to form water, part to oxydise the sulphur and phosphorus received with the food, and which are excreted by the kidneys as sulphuric and phosphoric acids.

P.—What is the average quantity of carbon daily thrown off from the lungs of an adult?

Dr.—About 160 grains per hour, or 3,840=eight ounces, *per diem*. The amount, however, varies much with the temperature, age, sex, constitution, health, disease, labour, rest, sleep, wakefulness, digestion, &c.

P.—Is the change which the venous blood undergoes physical or vital?

Dr.—It is explained on simply chemical laws, the same as take place in air out of the body, through a bladder. In this latter instance, the change affects only the surface. By the exquisite arrangement of the minute capillaries and cells of the lungs, the

blood is spread out into currents so small, as only to expose *one layer* of blood corpuscles at a time to the action of the air. Hence the change that is instantaneously operated in it.

The changes effected by respiration relate to the proportions of the different gaseous ingredients of the blood. The blood has a remarkable power of absorbing carbonic acid gas; as much as one and a half times its bulk. There is about ten per cent. of oxygen in arterial blood. In becoming venous it loses five per cent. The carbonic acid of arterial blood is about twenty per cent. of its volume; of venous blood twenty-five per cent. Through the medium of the lungs the blood absorbs water and volatile matters from the atmosphere to the extent of sixteen or twenty ounces in the twenty-four hours. This is not liable to be varied by those influences which modify the cutaneous transpiration.

P.—But does not the blood also rid itself, by the same means, of its superfluous water in the shape of vapour?

Dr.—Unquestionably. The *halitus* of the breath carries off a great deal. Much waste fluid is also *reclaimed* from the system by the action of the lymphatics. Their function is, no doubt, the gathering up of certain crude fluids that have exuded from the capillaries into the meshes of the areolar tissue; fluids hitherto unassimilated, or that have been deprived of their nutrient elements, but are still convertible into living structure. These fluids, being thus rescued and returned into the circulation by the lymphatics, very probably undergo elaboration, or a new vitalising process in the thickly strewn glands of that system, through which they have to pass previous to their re-introduction into the blood by the thoracic duct. When no longer serviceable for the purposes of the economy, it is likely that these fluids find exit partly by the lungs, and partly by the skin, or kidneys. The union of oxygen and hydrogen in the circulation may generate part of this water.

P.—Are the pulmonary excretions much disordered by disorders of the digestive apparatus?

Dr.—Greatly and often. In such case they are heavy, malodorous, loaded, no doubt, with unassimilated materials.

P.—But may not carious teeth, ulcerated throat and passages, &c., produce the foul breath you speak of?

Dr.—Undoubtedly they do. That referred to, however, is independent of such influence.

P.—Is it not generally alleged that miasmata, noxious gases, and other morbific agents in the atmosphere, are more readily introduced by the pulmonary surface than by any other?

Dr.—The allegation has every basis of truth. Analogous in action to these is venous blood, which has a depressing influence on the functions of the brain, and the nervous and muscular systems. The result of arrested respiration, that is, the retention of carbonic acid in the blood, is its stagnation in the capillaries (asphyxia, suspended animation). Hence its accumulation in the venous system, and the emptying of the arteries. In such cases, the heart ceases to contract. 1st, from the over-distension of the walls of the right ventricle, in consequence of the accumulation of blood in the venous system; 2nd, from deficiency of blood in the left, or arterial side. The contractility of the muscles of the heart is not finally lost, as soon as their movements cease. The withdrawal of a portion of blood, as by the jugular vein, will re-excite their action, by relieving the distension of the right auricle. So also are the movements of the heart recommenced by artificial respiration; oxygen being thus sent to replace the carbonic acid in the pulmonary capillaries. It has already been shown that the performance of the reciprocal actions taking place between the blood and the atmosphere, is the cause of the movement through the extreme vessels of the lungs.

CONVERSATION TWENTY-SECOND.

Of the function of Calorification, or Animal Heat.

Doctor.—The vital processes of warm-blooded animals require a constant and uniform amount of heat as the first condition of their performance. The provisions of the living economy for the generation of *heat*, and for the regulation of its amount, display the same consummate design in the Creator; the same admirable adaptation of simple means to complex ends; the same economy of agents, and the same luxuriance of products, that I

have had, and shall have, so often occasion to illustrate in explaining to you, and in developing the exquisite organism and functions of man.

PATIENT.—I believe the temperature of the human body keeps up to the same point in every climate, the coldest as the hottest.

DR.—It does so, nearly. Under any circumstances of temperature, disease, health, age, sex, individual peculiarities, &c., it varies but a very few degrees. A range of *eight* or *ten* degrees will comprise their utmost deviation either way from the standard of 98°. The average of such deviation is hardly *four* degrees.

P.—Is there any general or specific relation between the temperature of the body, and the rapidity of the circulation and respiration?

DR.—There is. In pulmonary diseases, for example, whether acute or chronic, in consequence of the active respiratory efforts superinduced, the temperature is unusually high, sometimes the skin is even painfully hot, and this in spite of great disablement or deficiency of lung. In cases of a contrary kind, where the circulation through the lungs, or the entrance of air, is impeded, as in cholera, asthma, narcotism, asphyxia from any cause, fainting, &c., the temperature of the body falls to the minimum, often to a deathly coldness.

P.—It seems, then, that notwithstanding the limited variation the corporeal heat admits of, yet man can exist, and exist in comfort and health, under the greatest extremes of external temperature, from a range in the torrid zone of 110°—120°, to 60°—80° below zero in the frigid zone! This is very extraordinary.

DR.—Yes; *so* extraordinary is the compensating and regulating power implanted in the human mechanism. In right of this, a man can go into ovens and furnaces heated even from 350° to 600°, and remain sometime with impunity. The degree of *tolerance* of great heat, however, depends on the dryness of the atmosphere, which facilitates the process of evaporation. Evaporation takes place from the body's surface, as from a moist dead membrane. Warmth and dryness are the favouring atmospheric conditions of evaporation.

P.—It is very conceivable how such a state of the air most readily receives, dissolves, and dissipates the watery halitus of the skin.

DR.—Besides this simple exhalation from the surface, excessive heat occasions the copious secretion of fluid by the cutaneous

glands. The water in passing off in the form of vapour abstracts and conceals a great proportion of free caloric; in other words, makes it *latent*, thereby reducing the temperature of the body. Under a hot *dry* wind exhalation and evaporation are very rapid. In a hot *moist* atmosphere, evaporation is checked.

P.—The large amount of caloric that becomes latent in the process of evaporation, being, it seems, the grand provision for *keeping down* the temperature of the body, what are the provisions for *keeping up* the temperature.

Dr.—These I shall now explain. It is a law of living organisms, whether plants or animals, *that, wherever vital processes are in active operation, there heat is proportionably evolved.* This is exhibited in the flowering of plants, and in the germination of seeds, the thermometer indicating 110°—120°. The evolution of heat in living structures, is in this way proved to be *a purely physical operation*, the product of the *organic functions.* The same causes that develope heat in the vegetable, are the agents of its production in the animal kingdom. In both cases an absorption of oxygen from the air, and an extrication of carbonic acid, are constantly taking place. *The liberation of heat is dependent on this change.* This effected through the leaves (their lungs), is to all intents and purposes *the respiratory process* of plants. These changes are also very active, at the periods of the germination of the seed, when the evolution of heat is also very remarkable. So in animals, there is an exact relationship between the degree of heat evolved, of oxygen consumed, and of carbon given off.

P.—The production of animal heat, in fine, according to this statement, is due to the various chemical changes incessantly taking place in the living economy, to those decompositions and recompositions of which living structure is the constant scene and seat. I suppose it is on the same principle that exercise augments the temperature?

Dr.—Precisely. Exercise increases the temperature, not simply by accelerating the circulation, but by *promoting disintegration of the tissues*, increasing the activity of those molecular changes that are the source of all power in the organism, the *primum mobile* of every function, the test of the existence of vital properties. These changes, as has been shown, constitute the essence of *nutrition* and *secretion.* The *nervous system* has plainly nothing to do with these molecular changes as a *cause*,

although it powerfully controls them. Nervous elevation or depression, therefore, *by elevating or depressing organic actions*, will elevate or depress temperature.

P.—The dependence of animal heat on the cutaneous and pulmonary traspiration, you have already adverted to. But as this is the fitting place for those details, I should like to hear them more fully discussed.

Dr.—Rabbits coated completely with an impervious paste, declined in temperature from 100° to 76° in an hour, and soon died. It was supposed that the pores being stopped, *i. e.*, evaporation being prevented, the temperature of the tissues would be sensibly increased, that, in short, the animal *would be parched up*, and die of a high fever! How unphysiological this expectation was, I think *you* will not require to be informed. You are prepared to expect the result of such an arrest of the circulating powers.

P.—The animals, it is clear, were asphyxiated, died from sheer want of circulation, from want of decarbonisation of the blood, from want of liberation of heat, therefore, from want of molecular change, from the absence, in short, of the elements of vital movement.

Dr.—You have stated the true *rationale* of their death. The younger an animal is, the less is its power of generating animal heat. The calorifying power increases as the bodily structure developes itself, or as the constitution acquires vigour. It decreases with the advance of life. It varies also with the season of the year. A cold day is ill tolerated in summer.

P.—Why?

Dr.—Because the system not having been at that season accustomed, or called on, to produce much heat, is ill prepared for an unexpected demand, *i. e.*, the organism has been accustomed to eliminate its superfluous carbon otherwise than by combustion. For the same reason, persons long resident in hot climates generally feel cold disagreeably. In diseases of sheer exhaustion, and in cases of starvation, death occurs by the cooling of the body consequent upon the loss of calorifying power, and the sheer absence of the materials of heat.

P.—Are there any supplementary sources of animal heat?

Dr.—Yes; I stated that the surplus of oxygen taken into the body, above that given out in the form of carbonic acid, amounts to 15 per cent. of the whole. Part of this unites with hydrogen to form water; part unites with the phosphorous and sulphur

of the ingesta, to be excreted as phosphates and sulphates. These and other chemical changes are supplementary sources of animal heat.

P.—How is the oxygen we inhale combined with the carbon set free by the decomposition of the living body?

Dr.—This is a physiological problem that still remains to be solved. After pondering considerably of late years over the great Leibig's works, and of other worthies to numerous to mention, the conjecture I hazard is as follows; only take it for what it is worth; I shall gladly abandon it for a better; in the meantime it is, perhaps, as feasible as anything current.

Electricity, as you know, is the most potent agent of all chemical decompositions and recompositions. The IRON of the blood globule takes with it from the lungs, besides oxygen, a *charge of electricity* into the innermost recesses of the organism, wherever living tissue needs repair, and wherever dead tissue requires abstraction. The difference in the products of nutrition in the several parts of living economy does not depend on a corresponding alteration in the character of the fluid or the vessel, wherefrom the operation takes place. No. The fluid and the vessel are common, the one identical in composition, the other identical in structure, in every part that receives the tribute of the common pabulum. In the same way, a GLAND, a nearly analogous structure everywhere, by the original constitution and law given to it by the Creator, elaborates from the same common and universal current products the most diversified. The difference depends on the peculiar vital affinities of each structure, for specific elements in the common nutritive fluid, whereby is brought about the deposit of the precise material wanted for the repair of that structure, and no other. This is the *law* which determines that the *common nutrient principle*, the blood-globule, shall here become brain, there bone; here muscle, there mucus; here membrane, there ligament; here tendon, there tooth; here nerve, there vessel. *The results are most diversified and unlike: the elements affording them few; the plastic, all-forming mother-fluid, in its living state in the vessels, is one and homogeneous.* It is highly probable, then, that wherever the wasted particles of structure call for new vital deposit to replace them, that there the intrinsic and congenial affinities of that structure determine the instant coalescence and amalgamation with them of the requisite materials in the blood-globule. *This is effected by the discharge of its electricity, in the*

same way as water is formed by the electrical explosion uniting its elements. Heat is evolved; the globules lose their tunics; set free their ingredients, and so leave it to the affinities of the part to incorporate what materials it requires.

P.—Thus you make it out, that by the all-wise arrangement of the Infinite Mind, every structure receives and appropriates to itself its own materials of repair, just in the measure, and in the time, its necessities demand.

Dr.—Yes; the crown and complement of the theory is this, viz., that in this electrical union of the blood-globule with the tissue, the oxygen unites with the liberated carbon and hydrogen of the decomposed structure, forming carbonic acid and water. In this way, in the minute capillary circulation, wherein these vital processes take place, the *scarlet* peroxide of the blood becomes the *purple* protoxide, having parted with its vital elements, and received in exchange the poisonous refuse and *débris* of the system. The water formed from the decomposed elements is partly given off in its course by way of exhalation, secretion, &c. The carbonic acid is set free, partly by the skin, but principally by the lungs, in company with the remnant of water, and other animal particles.

CONVERSATION TWENTY-THIRD.

Of secretion and excretion in general.

Patient.—You laid stress on the fact that the secreting process was an act of cell-development. The processes of nutrition and secretion, by that showing, must be nearly allied, if not identical.

Doctor.—They are. The whole body may be called a great secreting apparatus. Growth is secretion. Repair is secretion. Waste is secretion. The character of secretion has no connexion with, or dependence upon, any structural peculiarities. The secernent functions are, to a certain degree, vicarious, the secretion of one organ, when checked, being compensated by the extra activity of another.

P.—So anxiously careful, it seems, has nature been not to permit the accumulation in the blood of injurious materials.

Dr.—Very true. The materials of the secretions exist in the blood, and perhaps nearly in the state in which they are thrown off by the excreting organs. The meaning of the term *secretion* and the *fact* of the function exactly coincide. It is literally a *separation* of the elements of the blood for specific purposes in the economy.

P.—Will you specify these purposes?

Dr.—First; for the preparation of the nutritive materials.

Secondly; for the formation of solid textures or fluid deposits; as lime in bones, fibrine in muscles, gelatine in cartilages, the horny matter in the epithelial cells constituting hair, nails, &c., synovial fluid in joints, serous fluid in the areolar interspaces and in the shut sacs, fat in adipose cells, albumen in the humours of the eye, &c., &c.

Thirdly; for the elimination from the system of all substance, whose retention would be injurious, all wasted, extraneous, or superfluous matters. These constitute the *excretions proper*. By this, the human *waste-pipe apparatus*, the materials of repair are prevented from exceeding the amount of "wear and tear." The excreted products of the body are equal in amount to that of the solids and fluids ingested. Their chief source is the decomposition of the various structures: their *débris* are received directly into the returning current of the blood, and are thence carried to the various outlets for elimination.

P.—The sum of which is, that in the *outgoing* (arterial) circuit of the blood, it parts with its best elements; in the *incoming* (venous) circuit it gets charged with its most poisonous properties.

Dr.—Moreover, those plastic elements which in the *out-circuit* it has been deprived of, which it has yielded up to the growth or repair of the several structures, are restored at the end of the *in-circuit* by the tribute of the thoracic duct, whose fresh supplies are poured in near the heart.

P.—Another conclusion I draw from your observations is this, that the truly *vital* actions of the animal, the acts of nutrition, secretion, &c., consist of the reactions between the nutritious fluids and the tissues, or the solids they nourish. When their channels—the supply-pipes and the waste-pipes of the system—are obstructed, the incessant reactions and reformative processes

taking place in every healthy part, are marred or prevented in the diseased.

Dr.—You are quite right. But this *local* derangement soon diffuses its baneful influence, and we have what is called "*constitutional* disturbance."

P.—I hope, then, I am not wrong in this idea, that I do not attribute a low or unworthy *mechanical* function to a *blood-vessel*, when I define it as *a channel of supply*, and *a conduit of waste for the building materials of the body*?

Dr.—Your notions are quite just. In the wondrous fabric of animals, the purely *mechanical* parts have equal honour and equal utility with the purely *chemical*, or the purely *vital* functions. For the fundamental idea of a breathing, moving, self-repairing structure *is a circulating apparatus.* If any one function of living beings be more important, more indispensable, more characteristic than another, it is assuredly the circulation. The first want of animated existence is the *distribution* of nutriment; the next its *elaboration.* In the great circulating centres, the reduced plastic elements of the blood are replaced, and its exhausted vital qualities renewed.

P.—This function of the lungs, ridding the blood of its deadly carbonic acid, and receiving in exchange the vivifying oxygen and electricity of the atmosphere, seems to me a beautiful instance of the fertility of nature's resources, as well as of the economy of her expedients. With what admirable wisdom, with what exquisite contrivance, does the Creator take advantage of the simple properties of inert matter, to subserve the complex functions of living structure! But what is the actual seat, or active scene, of operations in glandular bodies?

Dr.—The cells which cover the membranous surface, and which line the follicles and tubes. Adipose tissue is an instance of a simple secreting cell. It separates fatty matter or oil from the blood; *but its contents are not poured forth by bursting.* The nature of the secreting cells of glands is, that they are so disposed on the surface of a membrane, that when they give way their contents are poured into the cavity lined by that membrane. The mucus which coats the surface of the mucous membrane is elaborated by the epithelium cells. These cells are continually cast off, and renewed from the germs supplied by the subjacent membrane. The *cells* of the intestinal villi select, and separate from the contents of the alimentary canal, the nutritious matters

to be introduced into the absorbents. In like manner, the cells of the secreting tubes, follicles, or passages of a gland, the *liver*, for example, separate from the blood certain effete matters they are constituted to elaborate and discharge.

P.—True secretion, then, is a vital act, not a mere physical *endosmose* or *exosmose*. In other words, it is not simple imbibition and transudation.

Dr.—Exactly. Here I should gladly discuss the details of the various secretions, as the tears, saliva, milk, &c. These are replete with interest in themselves. But they are irrelevant to the great *practical* objects I have in view, viz., to unfold so much of the mechanism and functions of man, as is necessary to establish a rational *theory* of the water-cure, to illustrate the true *modus operandi* of its processes, and entire curative agency. These will be found philosophical inductions, from the physiological premises I have laid down in this department of our conversations. The excernent functions, especially, are intimately, and on all occasions, brought into question in expounding both the *principles* and the *practice* of the water-cure. These, therefore, deserve a very particular attention. I have insisted on the prominent part the lungs take as eliminating or excreting organs. The SKIN will by and bye come in for review. There remain *three* other grand outlets of the superfluous, wasted, or noxious matters of the body, the liver, the kidneys, and the bowels. The latter will best find its place in treating of DIGESTION and DIET. At our next conversation, then, we shall take up the biliary secretion.

CONVERSATION TWENTY-FOURTH.

Of the function of the Liver.

Doctor.—The liver may be truly regarded as a *supplementary organ* to the lungs and skin, ridding the system of its superfluous hydrocarbon, whether directly emanating from the food, or whether introduced into the blood as the result of the body's

decay—the product of its wasted tissues. Yet it differs, in this respect, from the other two, in that the non-azotised substances which it eliminates, are previously turned to account, are economically rendered subservient to the purposes of digestion. The bile serves to reduce the *oily* matter of the food into a kind of soap, a state in which it may easily be taken up by the absorbent vessels. It also transforms sugar into fatty matter.

PATIENT.—But I suppose, this subsidiary function apart, the bile must be considered as chiefly an excrementitious fluid?

DR.—Precisely. The colouring and other matters of the bile pass off by the bowels. The fatty or soapy portion is absorbed, and ultimately eliminated by the respiratory process. The placing thus of a great decarbonising organ on the confines, as it were, of the digestive and circulating systems, shows the same admirable foresight of Providence, in anticipating every want of the economy; and the same consummate contrivance in providing every security for the proper discharge of its functions. On reflection, it will be perceived, that this organ is the more wanted, because, on the one hand, the carbon brought into the circulation from the decay or disintegration of the tissues, usually gives sufficient work to the skin and for the lungs to extricate it; and, on the other hand, the circulating channels would be *overflowed*, and the areolar tissue unduly impacted by oily matter, were the liver not placed where it is, as a check upon its introduction. Much carbon is absorbed, *at first hand*, by the mesenteric veins from the alimentary canal.

P.—You have made it appear that the great function of the VEINS everywhere is to abstract and carry carbon.

DR.—And truly. The processes of chymification and chylification largely develope carbon and hydrogen. A large portion of this is got rid of summarily, by the chyle going in the first place to the heart and lungs.

P.—This I understand clearly, recollecting that the thoracic duct, which is the great reservoir of *the lacteal system*, terminates in a venous trunk near the heart.

DR.—Understand, then, that to relieve the lungs especially of the duty that would thus be imposed upon them, in the case (which often happens) *of much oily food being taken, without a low temperature of the atmosphere to burn it off*, as so much fuel to sustain the animal heat,—in such case, the liver comes in to play a prominent part as a great decarbonising organ. The im-

mense quantity of blood it receives from the walls of the intestines, and which it decarbonises, places in a strong light the relief afforded to the lungs and skin, by the due performance of the functions of the liver.

P.—I suppose that, in the failure of the latter (the *liver*), the former (the *lungs* and *skin*), must do double duty?

Dr.—Yes, *if they can*. If they can*not* then disease will be the consequence. The prevalence of liver diseases in tropical climates, among those *who live after the fashion of the frigid zone*, will not now be difficult to explain. In the first place, their food abounds in carbonaceous products; the error being not less in quantity than in quality. In the next place, the amount of stimulating liquors taken to propel along their heavy ill-digested meals, aggravates the intestinal irritation, by recalling and *fixing* an undue amount of blood in the digestive mucous membrane.

P.—*In that case the surface must be robbed of blood to supply the extra demand of the interior?*

Dr.—Quite so. And it is precisely in this that the error of the mode of living in question lies. The cutaneous functions, for their active duties in hot climates or weather, require all the aid they can get, instead of their power being diminished by diversions of the blood to the interior, a loss of equilibrium everywhere and in all circumstances mischievous, but an evil of tenfold magnitude in burning climes. Moreover, the great heat of the tropical atmosphere reduces to the very minimum the quantity of carbon extricated by the lungs. Lastly, the want of active exercise, and usually indolent, luxurious habits, fill up the measure of the mischief; and this it does, by preventing that proper and due waste of the body which justifies full diet, and that activity of the excernent functions which passes off its superfluity. In the case of hot climates, the reverse order of things occurs, from that which takes place in cold climates. In the latter, the lungs and skin, in consequence of the active habits necessary to resist cold, effectually relieve the liver of any surplusage of duty, by the large outlet they afford for the carbon of the system, and by the large demand, in fact, created for it at these outlets, to keep up animal heat. Hence, the comparative immunity from bilious disorders, especially in cold weather, of persons of temperate and active habits. In hot climates and seasons, on the other hand, the consumption of carbon as *corporeal fuel* being null, or being reduced to the minimum, the labour of its extrication chiefly falls

on the liver. Hence this organ is overstrained or overworked, except in those who live a life, and adopt a diet, in all respects conformable to the organic laws and to the climate.

P.—This throws a great light to me on the prevalent diseases of Europeans in hot climates. I suppose, also, the same will serve to explain the great popularity of medicines (as calomel) that stimulate the function of the liver?

Dr.—It does; such intestinal irritants afford the needed relief; but it is only temporary. It is equivalent to borrowing cash at ruinous interest, cent. per cent. if you like; enabling the spendthrift debtor to go on for a time blindly squandering, but "pulling him up" so effectually in the long run, that he can neither borrow nor squander. He is corporeally *insolvent, ruined,* literally and truly. Medicinal stimulants, like other noxious "tipples," *leave behind the necessity for their repetition in increased dose.* This *tells* most destructively in the end, *as must tell always, the introduction into the system of any materials other than the elements of its structure;* which alone it was intended to receive, and which alone it is fitted to appropriate. Aught else received within it is a *profanation of nature's sanctuary,* which she visits, if often repeated, with the direst penalty.

P.—Well, from your metaphors and from your reasoning, I infer that these continued over-stimulations of the liver, at length end permanently disordering its functions and altering its *structure.*

Dr.—They do. Long-enduring nature will endure no longer; will stand no more tampering with. Further forbearance would be to forfeit her penalty, to give immunity to the transgressor of her laws. The day of reckoning comes; the retribution is exacted. Now appear the usual results of *over*-working; and *over*-exciting to get *over* the *over*-work; the organ, overstrained, disordered, *gives up* the unequal contest, sinks often, like an over-driven brute, to rise no more. With the break-up of a prime organ of life, profound disorder is gradually superinduced in the system, and the whole fabric totters to its fall. *At the best,* the *best* days of the individual are over, and this often in the very spring-tide of existence. For the remainder of such a life, the sun may rise as usual, and ride triumphant in the heavens, but the sunshine of day, and its cheering rays, are no more for him—life is for ever shadowed, clouds and darkness veil its prospects, and death is too often invoked as too tardy in its course for the impatient sufferer.

P.—I do not then wonder at the attacks of diarrhœa, dysentery,

cholera, and yellow fever, the four biliary plagues of hot climates, and which I now perceive to be the explosion of pent-up materials of disease; materials which it would seem patients voluntarily, carefully, perseveringly, resolutely, and as if, of set purpose, accumulate! Would that men would look upon diseases in the true light, wherein you now represent them, viz., *as efforts of nature to rid the system of substances undrawn off by the outlets appointed to eliminate whatever is superfluous or injurious;* mischiefs entailed too, as you show, by *paltry* indulgencies of the appetite, by *childish* dietetic excesses and irregularities.

Dr.—It will also be readily conceived how in such a state of body, charged and ready for a morbid explosion; how infected air, extreme heat, cold, or hardships, mental depression, profound agitation and disquietude, or the poisoned chalice of the false "comforter," will usher in general rebellion and anarchy in the living system; putrid fever (typhoid) perhaps, or rapid dissolution, or how the same causes will more slowly sap the system by insidious lingering disease.

P.—You mentioned before, a grand expedient resorted to by nature to rid the system of any excess of carbonaceous matters which the proper excretions have not been able to eliminate. This is to stow it away in the deposition of fat?

Dr.—Yes; in the shape of adipose tissue fat is virtually, *pro tempore*, removed out of the system; for it is out of the current of the circulation, and provided it be not engendered in excess, it is not an abnormal product. It answers as, or is convertible into, a granary for the nutriment of the system in cases where disease may cut off the supplies. In hybernating animals fat is stored up as a fund to draw upon when all the voluntary powers of the animal are in profound abeyance.

P.—While upon the subject of the bile, will you give me an anatomical *aperçu* of the liver?

Dr.—It is a large glandular mass, as you know, occupying the *right side*, partly under the false ribs, partly under the soft parts. In one point of view it may be represented as a great reservoir, situated midway between the apparatus of supply and the organ of distribution of the nutrient fluid, and evidently for the purpose of preventing the sudden influx on the heart, lungs, and brain, of blood as yet saturated with impurities.

Structurally, the liver may be regarded as a congeries of cells clustered round the ramifications of the hepatic duct, the portal

vein, the hepatic artery, and the hepatic vein. These are all as so many supporting twigs, of the *trame*, mesh, or ground-work of the structure. The cells are like so many berries clustering around every twig, and filling up every interstice. The liver also, has its lymphatics and nerves. The former are distributed on the walls of the vessels and nerves. All these are connected by fibrous tissue, the capsule of Glisson. *The secretion of the liver is entirely effected from venous blood:* the blood supplied by the hepatic artery being merely for the nutrition of the organ.

P.—You said that the proximate principles of the secretions existed in the blood; what comes of the retention of bile, for example?

Dr.—The materials of bile accumulate in the blood when its secretion is suspended, or what is the same in effect, when its outlets are stopped up, then jaundice supervenes. When this occurrence is sudden, the nervous system experiences all the shock of a narcotic poison, and death may occur rapidly. In cases where the jaundice ensues slowly and gradually, then the system has time to accommodate itself to the poisoning, and a surprising degree of tolerance of the constitution is manifested. But if the malady be unrelieved, if the biliary arrest be permanent, death is inevitable.

P.—I do not wonder, then, at *digestion* and *biliary derangements* so profoundly affecting the minds and spirits as they are known to do, considering the nice functions of the brain, the omnipresence of the nervous system, and the amount of *materies morbi*, retained excretions, sent floating through their delicate structures in particular, and through the system in general.

Dr.—You state correctly both the fact and its *rationale.*

P.—What is the use of the gall-bladder?

Dr.—It is not an essential part of the biliary system. It is only necessary to animals who eat at intervals, and is a simple provision for holding the bile till required for the purposes of digestion. In animals who are almost always ingesting aliment, there is no gall-bladder, the bile being poured into the intestine as fast as it is formed.

P.—What are the purposes the bile serves in the digestive processes?

Dr.—With your permission we shall leave that till we come to discuss systematically, and at length, the important questions of Digestion and Diet.

CONVERSATION TWENTY-FIFTH.

Of the function of the Kidneys—The Urinary Secretion.

DOCTOR.—THE structure of the kidneys is too complex to be well detailed and understood anywhere but in the lecture-room, and with every aid of microscope, scalpel, and *subject*. Its minute arrangements are of marvellous beauty, and of exquisite adaptation to the ends to be accomplished—the ridding the system on the one hand, of superfluous fluid, water more than the skin and lungs can exhale; and, on the other, opening a channel of exit for the effete azotised substances received into the blood, or elaborated therein.

PATIENT.—This makes good its title to your phrase and *idea* for the excretories, viz., a *safety-valve*—a means in the present case of keeping at a uniform standard the quantity of water in the system.

DR.—But this is not all. By so doing it regulates the amount of pressure on the vessels. Such a function is the more necessary, inasmuch as the waste of water by the cutaneous and pulmonary exhalation varies greatly with the temperature and hygrometric state of the atmosphere.

P.—The quantity of *mere* water, therefore, strained off by the kidneys, I infer, is regulated by the amount got rid of through the skin?

DR.—Precisely so; the former being greatest when the latter is least, and *vice versâ*. The quantity of *solid* matter separated by the kidneys depends on the amount of waste in the system, and the surplusage of *azotised food*. The kidneys have a twofold apparatus for accomplishing this twofold purpose. 1st. *Cells*, the TUBULI URINIFERI which elaborate the solid secretion. 2nd. The CORPORA MAPHIGIANA—bundles of capillary vessels which lie bare in the channels and outlets. These allow the transudation of simple fluid through their naked walls.

P.—From what you state of the nature and purposes of the urinary secretion, I conceive peculiar interest attaches to its alterations in disease.

DR.—Fortunately this is a subject now well understood, at least better understood than analogous derangements of the liver, and, perhaps, even of the excernent function of the lungs and skin;

for the reason that urine is readily obtained, and easily subjected to chemical tests. Of its solid matters *nitrogen* constitutes a large portion. The intense disturbance of the economy produced by even a partial suspension of the urinary secretion *show its* importance.

P.—I suppose the phenomena of disordered renal secretion, like those of the biliary, show directly the poisonous effect of the retention of its elements in the blood?

Dr.—Yes; disorders of the nervous centres, coma, and death take place, the same as from narcotic poisons. The presence of urea unduly in the blood is sometimes the unsuspected material cause of what are called diseases of the nervous centres. So the *sudden* stoppage of bile in its ducts, and its *rapid* absorption into the system, thereby producing *acute* jaundice, is, unless promptly relieved, as surely fatal as the most certain or virulent poison.

P.—This subject is too important to be lightly passed over. Here I should like you to give me some of your tabular data.

Dr.—The quantity of urine varies with the amount of fluid ingested, and with the temperature of the air. In winter, the skin, acting less freely, a larger proportion is carried off by the kidneys. The following is Berzelius's analysis of the solid urinary matter in 100 parts:—

Urea	(constituted)	45·10
Uric acid		1·50
Extractive matter, ammonia, salts, and chloride of sodium		36·30
Alkaline sulphates		10·30
Alkaline phosphates		6·88
Phosphates of lime and magnesia		1·50

P.—Am I right in inferring that the nature of the food, and the degree of exercise, will vary these proportions?

Dr.—You are. Let me observe here, that the urea may be separated from the urine in the shape of transparent, colourless crystals.

P.—I am aware, from what small modicum of chemical knowledge I possess, that such a state of combination is one utterly unfit for the nutrition of the tissues.

Dr.—Your knowledge on the point is quite correct, and brought in quite *apropos*.

P.—Pray what is the average amount of urea excreted in twenty-four hours?

Dr.—I believe I shall sufficiently answer your question, if I quote the following table from Lecanu (Journal de Pharmacie, tom. xxv.) which gives the mean of the results of one hundred and twenty experiments made to determine that point:—

By men	433·13 grains.
By women	295·15 „
By old men (84—86)	125·22 „
By children of 8 years	207·99 „
By children of 4 years	69·55 „

The quantities in this table, the amount of urea excreted, may be taken as a fair measure of the rapidity of interstitial change, at the different periods of life; in other words, of the measure of the vital activity of the tissues, especially of the muscular tissue. By violent exercise the proportion of urea in the urine is nearly doubled, compared with the state of rest.

P.—This increased waste of tissues explains the increased demand for food produced by exercise.

Dr.—Plainly.

P.—Will you give me some account of that much talked-of matter, *lithic acid?*

Dr.—Called also indiscriminately *uric acid.* This is an important ingredient in the renal secretion. If in undue quantity, it is precipitated on the cooling of the urine. Uncombined it does not exist in healthy blood. But combined with soda, it constitutes the gouty concretions, or chalk-stones, that are found in the neighbourhood of joints.

P.—Urine evidently contains a considerable amount of saline matter.

Dr.—Yes; and the elimination of this is a chief duty of the kidneys. These ingredients are ever being introduced by the food.

P.—Their undue accumulation is thus prevented.

Dr.—Of course. Common salt is decomposed into muriatic acid and soda. The former exists uncombined in gastric juice; the latter in bile. These again are recombined by the mixture of the bile with the chyme. The salt thus new formed is received into the circulation.

P.—How do you account for the *sulphates* found in urine?

Dr.—Not so easily. Sulphur is introduced in combination with the azotised principles of the food. This is oxidised within the system, and unites with any free base it meets with.

P.—How are the *phosphates* formed?

Dr.—In like manner, from the free phosphorus which certain alimentary matters contain. Phosphorus is a necessary constituent of nervous matter, the waste of which sets it free again. To be eliminated, it must be converted into phosphoric acid, and united with an alkaline base.

P.—In that case, mental or bodily labour, which, of course, induces much nervous waste, will necessarily be attended with an evident increase in the amount of alkaline phosphates in the urine?

Dr.—A just inference. The amount of azotised matter in the urine depends on the nature of the food. A part of it is derived from unassimilated materials in the blood. An over-supply of nitrogenous diet is more injurious than that of simply carbonaceous food. It does not produce either fibrous or gelatinous tissues, and the excess cannot be disposed of, or stowed away, like that of carbon in the system. It must be eliminated by the kidneys.

OF THE SKIN.

CONVERSATION TWENTY-SIXTH.

Doctor.—The *skin* includes, in its largest sense, not only the external coverings of the body, but also the *lining* of the cavities and passages which communicate with the exterior, that is, *the mucous membranes.* Both tissues taken together constitute a wall of circumvallation, as it were, around those grand central organs, on which depends the continued existence of the *individual* and the *race.* It is not, however, a "dead-wall," but one *alive, active, and sensitive at every point.* These membranous ramparts of the vital domain are guarded everywhere by sentinels (exquisite nerves), at once quick to perceive danger, and prompt to give alarm. It is, nevertheless, a limited and low view of this wonderful tissue to regard it merely as a fence or skin, a simple felt or hide, a covering or shield, to protect the delicate

surfaces and deep-seated structures, from the rude contact of things without, from the effects of weather, chemical or mechanical irritants, &c. It is much more. It is a sentient, sensuous, breathing, absorbing, exhaling, living surface; an organ as comprehensive in function as admirable in structure, of exquisite beauty, of prime vitality, and of incessant activity; one, in short, essentially important to the vigour, and comfort, and duration of life.

PATIENT.—All this, I suppose, is admitted and understood by *well educated* professional men?

DR.—Of course it is. They are familiar with a thousand facts, besides the occurrences of daily practice, which prove how great an emunctory the skin is, how intimate are its sympathies with interior suffering; how safe and efficient a field it is for *remedial operations;* how active are its powers of absorption; how keenly sensitive it is to atmospheric vicissitudes; how the interruption of its functions disturbs the harmony of the whole machinery; how their spontaneous excess (*sweating*) carries off acute diseases; how speedy and decisive are the effects of leeches or blisters (superficial irritants and revulsives) to *deep-seated* pain and inflammation; how in small-pox, measles, scarlatina, syphilis, it is a great derivative or safety-valve; nature thereby *saving the pith of the tree at the expense of the bark;* transferring interior irritation to the exterior; establishing *spontaneously* that *revulsion* which the physician seeks to effect *artificially;* how soothing is the application of hot fomentations, poultices, and water-dressings, to internal as well as to external diseases; how the wrinkles and dirty sickly hues of the skin indicate what the individual has gone through either in the way of moral or physical suffering; all these, I say, are facts of daily observation to the physiological practitioner.

P.—But I ask what practical applications have been made of the knowledge of these facts by ordinary allopathic practitioners?

DR.—You may well ask, what fruit has it borne? to what account has it been turned? If we except the debilitating warm-bath, and the often misapplied shower-bath, we find this great sentient surface, the skin, never invoked in the regular routine of practice. When we hear the most renowned expounders of "healthy skin" *still* talk of remedying its derangements by courses of arsenic; making no account of its failures for the ten thousandth time, and what is most of all, setting at defiance all the dictates of common sense and sound physiology.

P.—You *do* astonish me. As if a *healthy skin* was a thing attainable without *healthy digestive organs.*

Dr.—But granting that a transient make-believe cure were practicable *for the nonce*, at the expense of a half ruined (or a wholly ruined) stomach, is not the price too costly, such as no sane person, *who understood the bargain*, would consent to, however diseased his skin might be?

P.—And this, I presume, is called the enlightened science of the nineteenth century!

Dr.—You see where the allopathic hitch lies. *Without healthy digestive organs, the skin cannot long remain in a tolerably healthy state;* nor can it be really restored when once diseased. The skin, viewed simply in its excreting or eliminating function, *is of much more consequence than even the secretions from the bowels.*

P.—Is, then, this incessant source of daily anxiety to thousands exaggerated or gratuitous?

Dr.—It is relatively so. Of the function of the bowels we shall have much to say presently. More than four times the amount of actual matter is carried out of the system by the skin every day than by the bowels.

It may be safely affirmed, that in obstructed function of the inner and outer linings of the body, originate, on the one hand, the largest amount of acute diseases; and on the other, the most inveterate forms of chronic suffering. Their thickly-studded pores are so many waste-pipes, drains, and safety-valves through which issue every moment everything that is noxious, effete, or superfluous in the fluids or solids of the body, and all substances that, unremoved, would constitute a *materies morbi*, and mar the play of the vital mechanism. By the route of these structures must pass everthing that enters into the living territory.

P.—They are, therefore, the broad highways of communication with the world without, and the microcosm of man's body within.

Dr.—Precisely. Through these outer and inner integuments, the new materials of corporeal construction are carried in, and the old carried out; by their means is the blood purified, temperature regulated, and drooping vitality renovated. By the same channels carbonic acid, nitrogen, alkalies, acids, earths, metals, salts, and animal *débris*, are thrown out. In exchange for these—besides the directer nutrient fluids, water, vapour, the vivifying gases, and the electricity of the atmosphere, are taken in. As in the substances, of

which the skin and mucous membranes rid the system, they precisely resemble each other; so, in fact, their offices are convertible, reciprocal, substitutionary, vicarious; the suppression of one outlet augmenting or deteriorating the activity of another. These two membranous systems, however, differ in their means of communication with their visceral centres. Those of the interior skin are nerves of *organic life*, and are connected with their special organic centres of perception and action—the GANGLIA. The sensitive nerves of the skin, on the other hand, belong to the system of *animal life*, and communicate with the *cerebro-spinal centres.*

P.—I suppose the nutrition of the skin is accomplished, in part at least, through the agency of the nerves of organic life, of which you said a twig was sent to every blood-vessel?

DR.—True. In certain parts of the interior skin, *as at the entrances and exits of canals*, the nerves of animal, as well as of organic life, are distributed. *This is because these parts are the seats of superadded sensibilities, and are subject to the control of the will.*

P.—These nervous connexions, then, clearly explain the exquisite morbid and healthy sensibilities of the skin and mucous membranes, as well as their intimate sympathies with each other, and with the vital centres. Will you give me some account of the structure of the skin?

DR.—The skin is composed of two principal layers—1st, the *epidermis* or *scarf-skin;* and 2nd, the *dermis*, or proper sensitive skin. The former is a simple exudation membrane, poured out by the vessels of the latter. It may not inaptly be deemed and designated a sort of protection varnish. Like all other structures of the body it is of true cell-formation. The gradual development of these from minute granules, takes place in the deepest layer of the scarf-skin. Possessed of independent inherent power of life and growth, each cell draws to itself the fluid residuum of the colourless part of the blood, and secretes a horny matter. These cells lie layer upon layer, constituting a sort of mosaic flooring. As the deeper layers are gradually pushed onward and become superficial, their fluid portion evaporates, and they are converted into dry, flat, extremely thin, and dense scales. The abnormal accumulation of these scales is seen in many cutaneous diseases; notably in the *scurf* of the head.

P.—What is the chemical constitution of the scarf-skin?

DR.—Principally dried *albumen*. This is soluble in the alkalies.

Hence, the utility of *soap*—a compound of alkali and oil—as a detergent for the skin. The excess of the alkali in the soap combines with the oily exudation of the skin, and forms an emulsion. With the removal of the accumulated dirt, the superficial stratum of the scarf-skin is removed.

The *scarf-skin* is the seat of colour. The pigment-granules lie in the deeper, softer, newly-formed layers. This used to be called the *rete mucosum;* and was considered a separate structure. The intense colour of the skin is the index of the energy of its action. Exposure to the glare of the sun, is one grand condition of its exalted energy. Hence, the tanning of the skin, and all its various hues, from the pale northern to the swarthy inhabitant of tropical climes.

P.—Pray, tell me now about the *dermis*, or true skin?

Dr.—This is divided by anatomists into the *papillary layer* and *corium*. The latter is the part that is convertible into leather. It is a porous web of excessively minute fibres, collected into strands, and interwoven with each other, constituting a firm elastic net-work of great strength. The open meshes of these strands are filled with little bags of fat, a provision for elasticity; soft compressible cushions, fitting the skin to bear with impunity the unavoidable pressure and contusions it is daily exposed to. In the sole of the foot, and the palm of the hand, this is beautifully exemplified, and is an evidence of exquisite design.

The sensitive layer of the skin is thin, soft, uneven; pinkish in colour, and is a complete web of blood vessels and nerves. This vasculo-nervous web is everywhere heaved up into little conical prominences, termed *papillæ*. They may be compared to the *pile on plush*. Every papilla or tuft is composed of a minute vessel and nerve, each bending upon itself, *i. e.*, *ending in a loop*, and returning whence it came. In this way, there are four little cylinders, with their investing membranes in each papilla. The linear ridges and markings on the palms of the hand, and soles of the feet, are subdivided by cross lines into little square allotments, each made up of a tuft of papillæ, from ten to twenty in number. These minute vessels and nerves are so thickly set over the entire cutaneous surface, that the finest needle cannot be inserted into any point without wounding both a nerve and a vessel. To keep this exquisite structure moist, and to protect it from the rough collision of exterior substances, it is covered by the scarf-skin. The adaptedness of the innermost layer of the latter to

this purpose is sufficiently declared in its old name, the *rete mucosum* (moist net-work).

P.—What is the colour and condition of the skin dependent on?

Dr.—On the quantity, quality, and velocity of the blood in its superficial vessels. Its circulation is very much under the influence of the nervous system. The capillaries of the head, face, and neck may be *instantly gorged* by mental emotions, as shame or anger; and as instanly *disgorged* by fear. In the latter case, the blood retires from the skin to the central organs.

P.—How sympathetic an organ the skin is—how mobile, sensitive, and vascular, is now very apparent.

Dr.—The retardation of the blood in these papillæ, is the condition of cutaneous inflammation. The same cause, over distention of the papillæ with blood, gives rise to the mottled or livid appearance of the skin, when unduly chilled by exposure. The vigour of the nervous system is lowered by *undue* cold; *i. e.*, by the abstraction of heat *prolonged beyond reaction.* In this case much of the cutaneous blood is repelled inwardly, and accumulates abnormally in the centre viscera, obstructing their functions and obtunding sensation. The blood which remains in the cutaneous capillaries moves languidly along, or stands still altogether.

P.—There is great difference in the acuteness of the sensibility of the skins of different individuals. How do you explain this?

Dr.—This difference is referrible, in many cases, to original differences of constitution and endowment. It depends, in other cases, on the state of health, or sex, age, temperament, and acquired tendencies. It is more acute in the young than in the adult; in the female than in the male; in the sanguine and nervous, than in the phlegmatic temperament; in the weakly and diseased, than in the robust and healthy; in the intellectual than in the stupid.

P.—The *pores* of the skin are talked of by everybody. Will you describe them?

Dr.—Numberless minute tubes traverse the various layers of the skin, and reach the surface by a spiral course. These are about a quarter of an inch long, and constitute the perspiratory glands, oil glands, and hairs. The gland itself is no more than a coil of this tube. The lining of these tubes consists of three layers; derived, respectively, 1st, from the scarf-skin (which is their epithelium); 2nd, from the sensitive skin whereon their vessels and nerves are distributed; and 3rd, from the *corium*, whose strong fibres

and interlacements constitute the basis and framework of the whole cylinder. On the lines of the palms of the hands, and the pulps of the fingers, the perspiratory pores are distinctly visible at equal distances. Of these above 3,000 are contained in a square inch. This, at one quarter of an inch long each tube, will give *above* 70 *feet of waste pipe on every square inch of the body!* The extent of the body's surface is about 15 feet square. In all, the perspiratory pores of the body, if joined end to end, would *form a tube nearly* 30 *miles long!*

P.—The results of checked perspiration are now very conceivable. No comment is wanted to this fact, to demonstrate the derangement of health likely to arise from the obstruction of even but a *few miles* of this tubing.

Dr.—I think not. Yet in many diseases, both acute and chronic, the skin is almost useless as an excretory, its functions are all but suspended. It is either dry, parched, and burning—pungently so, as in pneumonia (inflammation of the lungs); or it is pale, flabby, lifeless, as in many chronic gastric diseases.

Substances contained in the perspiration, and whose removal is essential to health, are thus retained, circulated with the blood, to seek or force their exit by other and unwonted outlets. The effort of the extrication of these retained matters, falls on the liver, the lungs, or the kidneys, on one or all.

P.—These you well described as the grand eliminators of the system; the *safety-valves* that prevent the *explosions* that would otherwise be so frequent; as well from the excess of *fuel* used, and of *steam* generated, as from the *collisions* that daily happen in the eager contests of life.

But what do you say when the safety-valves refuse the supernumerary work thus given them?—when the organs thus forced to do double duty, break down under their extra labour?—when neither their own nor their vicarious function is performed?

Dr.—A deplorable case, and one of too frequent occurrence; the equilibrium, the proportionate play, of all the organs is then disturbed almost beyond remedy. Diseases of greater or less severity are engendered, according to the quantity and quality of the retained excretions. Drugs then are rarely competent to effect any permanent relief. Any hope that remains is in the resuscitation of the organic energies. *This can only be effected by the best hygienic agencies.* The water-cure, as a *formula* of these, is equalled by no substitute yet propounded.

P.—In any case, this *goal* of fast living reads us a lesson not to overtask genial nature—not to go on heaping abuse on abuse, with the hope that your *vis medicatrix*, gently coaxed, will put all right again.

Dr.—*But there is a limit to nature's endurance. Pass once that limit, and great is her resentment and retaliation for abuses.* On the side of the skin, nature, however, is certainly most placable, easiest to be coaxed, provided we only know the right way to set about it. When all the organs else seem rebellious, and all direct means of their pacification, *the great battle-field of the skin remains to us on which to quell the revolt.* On this bodily salvation is often achieved, and generally will be the result, by good tactics on the part of the general.

P.—The whole *primâ facie* grounds of the case, make very clear and strong the pretensions of that system of medical treatment by whatever name called, by whomsoever practised, that can thoroughly excite the functions of the skin, without overtasking its powers, and without overstraining its structure.

Dr.—Such a system the enlightened and experienced "water-doctor" claims the credit of administering.

P.—I shall sift one day, I hope, to the bottom the *rationale* of your hydropathic operations and pretensions. Meantime, to proceed with the skin, I think the calculation is that about two pounds of perspiration take place in the adult in twenty-four hours.

Dr.—From 2 to $2\frac{1}{4}$ lbs. is the average. This is incessantly going on: but the fluid is carried off in vapour, *insensible perspiration*, as fast as it is formed. Under exertion it is seen oozing from the pores in clear drops, *sensible perspiration.*

The exhalation from the skin is much influenced by the varying states of the vascular and nervous systems. Excessive fear will suspend it altogether, or induce it profusely.

P.—How far is suppression of perspiration in fever cause or effect?

Dr.—This will more properly be discussed hereafter.

The oil-glands and tubes of the skin resemble the perspiratory, both in structure and course. They are absent in the palms and soles: they are abundant on the shoulders; on the face and nose; at the roots of the hairs of the scalp; in the ear-passages, and along the ridge of the eye-lids.

P.—I suppose the unctuous secretion, according to the analogy of the other secretions, takes place from cells.

DR.—Yes; these when fully formed burst. The collapsed cells are cast off in minute scales, and expelled from the tubes in company with the oily product. In disease, these actions become irregular from torpor of the skin on the one hand, or from inflammation on the other. The contents of these cells become unnaturally solid and dense; or are only partially emptied; or get impacted in the tubes, which become inflamed, constituting the disease called *acne* (popularly called "grog-blossoms"). From smoke, dirt, or dust the projecting point of the tube gets blackened. This unctuous matter contains an animalcule resembling a caterpillar or wood-louse.

P.—What are the uses of this oily matter?

DR.—Various. To lubricate the scarf-skin; to prevent its peeling off; to defend it from the contact of acrid substances; to repel moisture; to prevent its too easy escape from the skin; to confine the tears and moisture of the eye within the lids; to defend the conjunctiva from the irritation of fluids or minute solids, and to guard against their adhesion. In the ears, it moistens the passages; and with the hairs offers an obstacle to the intrusion of insects.

P.—You have already adverted to the important influence of the cutaneous transpiration in the vital processes. I am inclined to believe, from what you said in reference to the forces concerned in the circulation of the blood, that the greatest function of the skin, at least one of paramount importance to its excreting office, is its subserviency to the motion and distribution of the fluids of the body.

DR.—This is perhaps the latest great discovery of science, and we owe it to the analytic genius of LEIBIG, who has made it very apparent in his work "On the Motion of the Fluids." I have stated one-half of the *modus operandi* of this influence. The other half now remains to be expounded. This is a subject deserving much attention. For though the fact be familiar, its explanation is almost unknown; at least its practical bearings are neither recognised nor acted on.

P.—This should not be.

DR.—Well, then, understand that *the force or influence which promotes or produces the ascent of the sap in plants, viz., the exhalation from the leaves, is one identical physical principle with that which determines the motion of the fluids of the body*

towards the exterior, that is, the transpiration from the skin and lungs.

All liquids in connexion with an evaporating membrane acquire motion towards that membrane. The amount of the motion is directly proportional to the rapidity of the evaporation, *i. e.*, stands in a fixed ratio to the temperature and hygrometric state of the atmosphere. Capillary attraction fills the vessels; but it does not cause the fluids to rise. *The motion of the fluids belongs to or is derivable from the evaporating surface.* The evaporation constantly taking place, in the state of health, from the large exhalant surfaces of the skin and lungs, produces a virtual vacuum within the tubes, whence the fluid oozes out, and is evaporated. By the external pressure of the atmosphere, and by the vacuum created in the lungs at each expiration, the fluids are forced, or rather drawn, into the superficial capillaries. The fluids, therefore, in this way, acquire a motion to the surface, which is accelerated by the other powers concerned in the circulation of the blood. The suppression of transpiration (as by improper exposure to chills and draughts when freely perspiring, or by states of the atmosphere in which heat and moisture coincide, and, therefore, the conditions of evaporation fail) is followed, of course, by a check to those outward motions of the fluids. A primary condition of life is thus interfered with. If the powers of vital resistance be not strong, or if, at the same time, the body be otherwise diseased and weakened, interior congestions, stagnations, or sanguineous accumulations in vital structures, especially in the mucous membranes, arise. Hence we find the entire obstruction of the skin (as from putting an impervious coat of pitch on a rabbit), by preventing exhalation, and therefore the circulation and oxygenation of the blood, *rapidly diminishes the animal heat*, in fact, asphyxiates. The rabbit so treated dies in a shivering fit. In *epidemic cholera*, the function of the skin, and probably the lungs, is *from the first* interfered with. Exhalation from the surface failing, and the more fluid portion of the blood being drained away, by the immense surface of the bowels, the circulation is soon brought to a stand. Hence the *deathly coldness* characterising the disease, and the *blueness* from the entirely venous character of the blood. In this state of matters that the vitality of the blood should be reduced to the lowest ebb is to be expected; is, in fact, unavoidable. *Hence the chemical affinities of the*

blood's constituents gain the ascendant over the vital. The serum separates from the fibrine, and the channel of its outlet once being opened from the congested intestinal membrane (where the blood has retreated and accumulated on being driven from the surface) there is nothing in the unaided powers to stop the drain of vitality. The salt of the serum, indeed, *operates as a cathartic* on the exhalant vessels: the drain goes on so long as there is any serum to drain away, and the system sinks, "dead-beat" in the unequal contest. Yet even in these cases, genial nature occasionally, if not previously tampered with, teased, and irritated, will rally. The blood-vessels will come to contract down upon their diminished contents, fresh serum will be absorbed from every soft tissue, and the *salutary* thirst that exists will soon supply its lack, and the patient will in no long time be resurrected from apparent death to life. It would be out of place to refer in our present conversation to the best mode of applying the water-cure treatment, or to the errors that have been committed by those willing to try it, but without understanding its *modus operandi*.*

* The wet sheet packing was quite out of place, as it was tried for cholera. On the first great appearance of epidemic cholera in this country, I had been some time in practice in London, and a great many cases fell under my care; from over-fatigue I became a well-marked case myself. At that time I published many cases in the *Lancet*, giving the preference to cold treatment. The best mode of applying the Water-cure in the treatment of cholera I will lay before the reader at a later period.

PART THIRD.

A

POPULAR EXPOSITION OF THE SCIENTIFIC DETAILS

OF

NUTRITION, DIGESTION, AND DIET.

CONVERSATION TWENTY-SEVENTH.

Spontaneous decomposition a law of inorganic nature—Its operation on living beings renders alimentary organs necessary—Complex processes of nutrition—Law of progressive development, from primary types—General laws of Physiology—Cells the essential instruments of vital structure—Supremacy in man of the animal over the organic system of nerves.

DOCTOR.—I HAVE already called your attention to a great law of *inorganic nature*—the law of *spontaneous decomposition*, or *perpetual molecular change*. I have also insisted on the fact, that *the matter composing living organised structures forms no exception to this law;* you observe its very evident and active operation in both animal and vegetable substances.

PATIENT.—It is then, I see, a primary law of the physical world in general. How would you define or designate it?

DR.—In strict terms, *the tendency of compounded bodies to return to their primitive elements*, i. e., *to be decomposed by those chemical affinities, or mutual actions and reactions among the particles of matter that are ceaselessly at work in the world around us.*

P.—The operation of that *law*, then, you would lay down as the first source of the decay of living organisms?

DR.—Certainly; and, therefore, I was called upon to adduce it among the reasons that rendered necessary *an apparatus counteractive to it*, viz., ALIMENTARY ORGANS—the prime requisite, and the essential condition, of the existence of both plants and animals. The office of this apparatus is the conversion of materials supplied by the external world, into the organised structures of the individual, whereby their vital properties are maintained,

their functional powers replenished, their waste repaired, and their growth provided for.

P.—Of course you would, in general terms, call this the act of NUTRITION. What does it include?

DR.—A series of complex processes, by which the crude pabulum of organised structures is gradually elaborated and perfected, circulated, and assimilated. Here, as elsewhere, nature shows herself true to her *law of progressive development, i. e., a gradual* advancement from primary types, as regards *structure*, and a *gradual* perfecting of her operations as regards *function*.

P.—I think a survey of creation, especially of the animate world, makes it very clear that nature in her works never rises *at a bound*, or makes a great leap. There is a measured ascent from the low and preparatory to the high and perfect.

DR.—A sound principle, undoubtedly. We shall proceed now to deduce those great GENERAL LAWS OF PHYSIOLOGY, as a result of which living organisms resist the decomposing agencies to which all things else yield; and by which it is brought about, that during a certain definite period their internal structure and external lineaments, remain identical in composition, and unaltered in conformation.

P.—What, then, would you say was the *first* general law of the economy of animated nature?

DR.—This, *that vitality counteracts the simply physical or chemical laws; in some cases suspending their operation; but always by neutralising their effects.* This last object is accomplished *by renewing structure as fast as it is disintegrated, and by simultaneously removing the products of decay.*

P.—You mean to say, that as fast as the vitality of the *old* matter is exhausted, and its constituents *used up*, decomposed, and carried out of the system, *new* matter is, *pari passu*, assimilated and incorporated?

DR.—Yes, precisely; secretion is perpetually putting down fresh structure; absorption, at the same rate, taking away the wasted structure. Thus it is brought about that every tissue, every organ of the body, is enabled to retain its primitive properties and constitution, to grow and mature, to preserve its heat, to throw off its waste, to repair its decays, and to exercise its functions, *so long as it is supplied with the requisite materials.*

P.—This unfolds, in the clearest manner, the broad foundation for the necessity for food, the source of the demand for nutriment

to all living beings, viz., that it affords the conditions, 1st, for extending or building up the organism; 2nd, for supplying its wear and tear; 3rd, for maintaining its heat.

Dr.—Exactly. We thus reach the SECOND general law of physiology, viz., *that the maintenance of the vital properties, and the normal structure of organised bodies, is made to depend on the due reception of elementary matters from without, their conversion into a homogeneous mass, whence are drawn the materials that supply the growth, or renovate the waste, of the system, and the excretion or throwing out of the refuse and worn out particles.*

P.—I should set forth this law in briefer terms, thus, *the perfection of organised structure is necessary to the perfect performance of vital function, and the grand pre-requisites for perfect structure, are the constant entrance of new matter, and the uninterrupted exit of old materials.*

DR.—Perhaps a clearer enunciation of the law. To meet its requirements we have the three characteristic and fundamental provisions of the structure of all living beings. 1st, a nutritive apparatus; 2nd, the contact of food with it; 3rd, organs for excreting waste, or eliminating excrementitious particles.

But I hasten on in my enumeration of the great laws of general physiology:—

III. *In disease, or mechanical injury of the body, the ordinary preservative processes become the extraordinary reparative agency.*

IV. *In proportion to the activity of the vital action of living beings, is the expenditure of vital power and waste of organised substance.*

P.—It stands, therefore, to reason, that the more intense the action of individual parts, the more limited must be the duration of the life of these parts?

DR.—True. The same also is predicated of the whole organism as of its parts. CELLS, you will remember, are the essential instruments of vital functions, and elements of vital structure. These go through a certain series of changes—grow, mature, and decay. There is no break or gap in the succession, no delay in the evolution, so long as life lasts, or health continues. The place and functions of the old cells, are instantly taken up by the new. Their death and renewal are rapid, in the ratio of the energy of the tissues, and operations they subserve. The *animal* functions, for example, exhaust and reduce the nervous and muscular structures. The demand created for the reparation of these fabrics

increases the activity of the *organic* processes thereto appointed. In man especially, the incessant activity of his nervous and muscular systems occasions great disintegration of their substance—great waste, and creates a corresponding demand for materials of repair.

P.—I recollect you mentioned that each effort made by a tissue or organ, every functional operation, every movement of a muscle, every thrill of a nerve, every act of volition, even every uprising of a *thought*, destroys the actual and normal composition of the parts concerned in their production.

Dr.—True. The supposition is based on good grounds, that a portion of the stricture *virtually*, if not really, *dies*, as the result of effort, is thrown off from its place, and is eventually thrown out of the system.

P.—The preparation, and replacement of the materials so made room for, will fall, according to the views you have propounded, on the ORGANIC, VEGETATIVE, or NUTRITIVE functions ?

Dr.—Just so. This leads to the establishment of another grand law of physiology, viz. :—

V. *The activity of the animal functions is the measure of the healthy activity of the nutritive functions*, and *constitutes the standard whereby the natural demand and disposal of food are regulated.* This is the foundation of a very important principle in dietetics, which will be discussed in its place.

A *sixth* grand law of general physiology is this : *that the materials of the nutrition of living organised structures can be introduced into their systems only in a fluid state.* Liquids or gaseous substances are the sole matters absorbable by either plants or animals.

P.—Is not the ingestion of solid aliments, or organised structures, as bread, cheese, fruit, fish, oysters, hard eggs, meat, &c., all masses more or less coherent, a contravention of this law ?

Dr.—No, not at all. But to meet the necessity created in this case, the necessity, that is, for *reduction* and *solution*, another general physiological law is established, viz. :—

VII. *The alimentary matters of animals, before they can become part and parcel of their fabrics, must undergo various preparatory changes in apparatus expressly constructed for the purpose.* We shall not stop, at present, to detail the various steps and processes by which the changes in question are brought about. The series of these constitute the natural heads or divi-

sions of the subject, and will come in for full discussion afterwards.

An EIGHTH general physiological law is this: *that a superior function requires a superior organisation.*

P.—That is very supposable; with the degree of elaboration necessary to reduce crude materials into the nutrient elements of the body, the digestive apparatus will become more complex and refined.

DR.—It does. New organs are successively superadded, and one part of the apparatus becomes more and more insulated from the rest. Hence—

A NINTH physiological law, viz., *that a superior function necessitates and superinduces a corresponding elevation of structure in all its co-related functions.* 1st. In the *organic*, in order that all the vegetative processes may proceed with complete effect, and work in perfect harmony. 2nd. In the *animal functions*, in order that the individual may be better capacitated for his increasing relations with the world without, from which he has to derive his means of subsistence. With more elaborate digestion, muscular and nervous systems, the movements and instincts of the animal become both more diversified and more definite. To match with this more complex organism, and at the same time, as the result of it, we have, with the gradual rise in the scale of being, an increasing power of forecasting future events, of forethought, and providence, a perception of the relations of cause and effect, till we arrive at the highest psychical endowments of the noblest animal—man.

The TENTH great law of general physiology is this: *that the structure of living beings is modified to meet the various conditions of their existence.*

The ELEVENTH is this: *that the character and provisions of the digestive apparatus bear a direct and intimate relation to the nature of the materials to be acted on, i. e.*, to the kind of aliment on which the animal is constituted to subsist.

The TWELFTH and last law of general physiology it is necessary here to deduce and adduce is this: *that the digestive apparatus in its turn, necessarily determines the peculiar construction and capabilities of the rest of the organism. This is true of all animals save man.* It is his high prerogative, his enviable distinction, to be exempt from this law, to be rendered superior to it. In *brutes*, their structure and psychical endow-

ments have an exclusive reference to their alimentary organs, or reproductive functions. In them the instruments ministering to the faculties of *will*, *thought*, *purpose*, *effort*, are all subservient to the simple procuring of their subsistence, or the perpetuation of their kind. In them the apparatus of *animal* life is the mere tool and slave of the *organic*. The development and exercise of their nervous and muscular systems are for the simple and sole advantage of their nutritive organs. But in man, on the other hand, it is widely different from all this. He is exalted and privileged above all. As "a being of large discourse, looking before and after," his apparatus of organic life is, or *ought to be*, the mere instrument and servant of his animal functions. His nutritive powers are, therefore, almost altogether for the exercise of his nervous and muscular systems. Would that he *always* rightly appreciated and worthily used his godlike endowments! There is a cheering prospect that the time may come when he shall or will.

CONVERSATION TWENTY-EIGHTH.

Plants and animals—The one simply vegetative—The locomotion of the other, making the possession of a receptacle necessary to carry the nutrient soil—Convertibility of the outer and inner surfaces—Progressive development of digestive organs—The alimentary passage virtually exterior to the actual seat of vital operations—Digestion how far vital and chemical—Chemical constituents of the food and blood the same.

Doctor.—The economy of the nutrition of plants differs as widely from that of animals, as the different conditions of their existence and modes of being.

Patient.—Plants, certainly, have no sentient life, no voluntary power, no locomotive organs, no digestive cavity.

Dr.—No; nor its associated apparatus of reduction and solution. They need none of these things; their food is water, with the inorganic constituents dissolved in it (alkalies, earths, and mineral

ingredients), and the gases of the atmosphere disengaged from decomposing organised substances. Their food being liquid, and unorganised, there is no necessity for its being delayed in a digestive canal for the purpose of undergoing changes preparatory to absorption. They are, moreover, immovably fixed to the soil, always in contact with their food; all they require, therefore, is *an absorbent apparatus*—roots, stems, and leaves. Hence, in them, digestion and a digestive cavity are susperseded.

P.—You would say, then, that the purport, end, and destiny of the plant were simply *vegetative?*

Dr.—Clearly; to convert inorganic elements into organised substances fit for the nutrition of a higher order of beings.

P.—Animals, then, as a result of their nutrition alone, differ widely from plants in all the great characteristics of their being?

Dr.—True. Their food is not conveyed to them mechanically, without will, without consciousness, and without effort; on the contrary, *it requires to be sought for* by the exercise of the voluntary powers. Animals are endowed, therefore, with the faculty of locomotion, and need, of course, to carry their food with them, in all their changes of place. Hence the distinctive mark, the pre-eminent characteristic of animals, even of those lowest in the scale, is *the possession of a stomach;* a special alimentary cavity, or canal, appropriated to the reception and preparation of their food; moreover, the food of animals being vegetable and animal substances, organised masses, therefore, more or less solid, it requires a superadded apparatus for its *division*, *solution*, and *dilution*, to separate its impurities, to elaborate its crude materials, or to modify its prepared elements, to correct the tainted, and to neutralise the acid or the alkali; to fit, in short, the nutrient principles to be taken up into the living system.

The alimentary canal of animals is virtually exterior to the body. It is a simple inversion of the outer corporeal covering, as we find in the lowest class of animals—*polypes.*

P.—These little creatures are, I believe, *all stomach?*

Dr.—Yes; they are a sentient self-moving digestive sac, formed by the mere reflexion of the external integument, which is closed up, all save a small passage, which serves at once as the inlet of the food, and the outlet of the excrement. In the walls of this common cavity, both gastric and biliary fluids are secreted. It is otherwise destitute of any instruments of divisions and communication. The orifice of its stomach is surrounded with vibratile *cilia*,

which determine currents of water towards it. In these currents the nutriment of these simple beings is floated, namely, animalculæ, insects, &c. Their external surface is easily convertible into internal. The wood-cut at the end of Vol. I. will give a clear idea of this primitive creature.

P.—Do you mean to say that they may be turned outside in without deranging their functions?

Dr.—Such is the interesting fact. *This identity of structure and convertibility of function of the outer and inner surfaces or linings of the body, to a certain extent, prevail throughout the entire grades of the animal kingdom up to man.*

P.—This anatomical and physiological fact I should deem to be of most significant application to pathology and practice.

Dr.—It is. Let it ever be remembered, as well by the invalid as by the practitioner, that the difference between the skin and mucous membranes is more in situation than in structure or functions. They are composed of one continuous vasculo-nervous web, formed by the interlacing of the minute extremities of arteries, veins, nerves, and absorbents proper. Taken together, these *two grand sentient surfaces* constitute one universal unbroken inner and outer surface of absorption and elimination, of secretion and excretion; and each endowed with its own sensibilities, totally different in kind, but equally exquisite in their sphere. From the very nature of membranes, I should infer that they are all, the mucous, the cutaneous, and the serous, *ex officio and per se, secreting and absorbing surfaces.*

Dr.—They are. In beings a step higher than polypes in the scale, the digestive cavity is provided with *a second orifice*, and *a regular intestinal tube leading to it*, through which the little pellets of excrement are rejected. *Gastric juice* and *bile* are secreted in the stomach, and the food before entering is subjected to a *true grinding instrument*, a gizzard, a substitute for teeth.

P.—I suppose that the complex and multiform intestinal organs of the higher grades of animals, are only extended developments of these simple types?

Dr.—Just so. Bit by bit, as we ascend in the scale, the stomach becomes more and more a distinct compartment of the alimentary canal. The biliary follicles are collected into glandular masses, like currants on a stalk, and are also removed from the walls of the stomach. The stalk represents the duct by which these glands empty the tribute of their secretions into the digestive tube, at a

little distance from the stomach. The gastric juice is secreted in minute sacs, imbedded in the substance and lining membrane of the stomach. Accessory glands, as the *pancreas*, are added. This we find so low down in the scale as the *cephalopoda* (cuttle-fish, nautilus, &c.). By and by, well-defined and separate salivary follicles make their appearance. But on the subject of the comparative anatomy of the digestive apparatus, the objects and limits of our conversations prevent us from enlarging. Only let me make this remark, that, in ascending to the more perfect animals, the vertebrated classes, remarkable modifications are made, according to the requirements of the food. As an illustration of these we may cite the provisions of structure, adapted to reduce respectively vegetable and animal nutriment to the condition necessary for its absorption.

The alimentary canal being a passage through and through the body, its linings necessarily encloses, and is, therefore, to all intents and purposes *outside* the vital viscera. Matters in that interior tube, are for the same reason *exterior* to the true and actual seats of vital operations—the great organising, transmuting, or assimilating apparatus—as much so, as if they were laid simply in contact with the skin.

P.—It is plain, therefore, that food in that cavity cannot be subjected to any vitalising process.

Dr.—A correct inference. The change effected is simply *chemical*, not *vital*. It consists in soaking or maceration of the food in certain juices, its reduction to a soft, pultacious, homogeneous mass, and the precipitation of its coarser, undissolved, or feculent portion. Digestion, in short, is a mere solution and separation of nutritive materials. It can only be called a *vital process*, inasmuch, and in so far, as the nervous agency and the muscular movements that thereto contribute, are vital operations, depending on the vital properties of the tissues; and the solvent fluids, the salivary, gastric, and pancreatic juices, with the bile, are products of the living structure. If not of all these fluids, we *can* affirm at least of the chief, the gastric juice, that it acts on alimentary matters *in a manner exactly conformable to the laws of chemical solution*, viz., *to the extent to which it can saturate*. This saturation is aided—first, by minute division of the matter to be dissolved; second, by thorough contact of the solvent fluid with its particles; lastly, by elevation of temperature; all which conditions are wonderfully secured by the apparatus nature has pro-

vided in her living laboratory. With infinite wisdom, and provident care, the Creator has established a fixed relation between the nutrient principles in the diet, and the living fluids of the animal.

P.—I suppose *the chemical constituents of blood and of food are the same?*

Dr.—You are right. Whatever be the varieties of food, however heterogeneous in appearance, or different in source, they all reduce themselves, on ultimate analysis, into the same nutritive principles, albumen, fibrine, caseine, &c. The homogeneous chyme of the stomach are these principles in a simply reduced and diluted form, mixed with certain excrementitious portions.

Blood is a fluid containing all the heterogeneous substances of which the body is built up. The act of nutrition or assimilation consists in the separation and deposition of these constituents of the blood, at the parts of the fabric where they are needed. Each tissue possesses specific vital affinities for those ingredients of the blood which its composition and constitution require.

P.—That is to say, according to your cell-doctrine—that the *rudiments of structure*, the vital globules or organised and organising cells of each particular tissue, have their own exclusive and unchanging affinities, each tissue for those materials in the common pabulum, or circulating fluid, necessary to the formation of that tissue. I conclude, then, that the variety of animal structures depends, not so much on the variety of building materials, as on the diversified arrangement of the same materials. In the same way as in other buildings we have a few staple materials, stone, brick, wood, iron, mortar, wrought into every diversified form, according to the diversified style, plan, use, and appropriation.

Dr.—Precisely so. You may then conceive that if the chemical constituents of blood and food be the same (as they are admitted, indeed demonstrated to be), all that is necessary for the animal process of blood-making and tissue-constructing, is the *solution*, the *dilution*, the *purification*, precipitation, or straining, *the intimate mixture of the old blood materials with the new, and the final vivifying touch to the whole, given by the inhaled atmospheric oxygen and electricity.* You may well signalise and admire that infinite wisdom, which has established this fixed relation between the nutrient principles of all alimentary articles, and those of the living solids and fluids of the animal.

P.—It does strike me as an instance of the watchful care of

Divine Providence, this coincidence between diet and structure. To me, also, it appears a signal proof of design—viz., the series of provisions made in the animal economy (according to the view you present), for the gradual approximation of the nutrient principles of the food to the nature of animal substance.

Dr.—The same remark applies to the wonderful elaboration of the diversified vegetable products out of the few and simple inorganic elements contained in the soil, or floating in the air.

P.—No wonder the inspired Psalmist in contemplating the Divine arrangements of creation as seen by the light of *his* day, broke out into the apostrophy "Marvellous are thy works, O God! in wisdom hast thou made them all." I have heard of the experiments on artificial digestion—what say they?

Dr.—They throw much light on the nature of the stomach's operations. But independently of these, taking the case on *à priori* grounds, and in those of common sense alone, we shall inquire, what is the true function of the alimentary canal, and what changes the food there undergoes? The stomach is unquestionably, and simply, a provision for the reception, retention, and preparation of food, a receptacle wherein its contents are reduced to a state fitting them easily to yield up their nutrient elements, to the absorbing and secerning apparatus, in order to become assimilated to the living solids and fluids.

P.—The specific function, I conclude, then, of a digestive tube is the *fluidification of nutriment?*

Dr.—Right; beyond all contradiction. For no nutriment can nourish or be absorbed unless in a fluid state. The agents by which this is accomplished are the juices and fluids of the intestinal cavities, the secretion of glands both large and small, isolated and clustered.

The *transforming* or *vital elaborating process commences with the absorption of the food into the vital field* of operations, that is, in the lacteal glands and absorbents; and is completed by the subsequent changes the blood undergoes in the lungs.

P.—The true idea and office, then, of a stomach or alimentary canal, which you establish, is that of *a receptacle for the nutrient soil of animals*, so to say (that from which they derive their subsistence—the new materials of their ever-wasting forms), *a medium in which to dissolve and dilute their alimentary matters, so as to separate the nutritious from the excrementitious portions.*

Dr.—*That* I believe to be the real truth of the matter.

There is a perfect analogy between the absorption and elaboration of the *sap* of plants and those of the *nutrient juices* of animals. As the sap ascends from the roots it is a crude fluid at first, but gradually acquires sweetness, acidity, lime, potass, sugar, mucus, albumen, an azotised substance like gluten, &c. *But it is only after they have been subjected to the oxygen and electricity of the air by means of the stomata (pores) of the leaf, that the nutrient fluids are perfectly elaborated, and fitted for the deposition of the characteristic products of vegetables.*

P.—I think these facts significantly point out to us—*if we rightly read the analogy*—what is the real function of the alimentary canal of animals, and what are the vital processes that subsequently take place in the absorbent and aërating apparatus.

Dr.—There can be no doubt about it. The alimentary matters contained in the stomach and bowels are tantamount to the nutrient soil of plants—to borrow your appropriate metaphor. The true idea of a digestive canal—as you have properly inferred it—is that of a cavity wherein to contain this soil, to dissolve and dilute its nutritious parts, and to separate their impurities; a receptacle, in short, wherein the available alimentary principles may be prepared easily and safely, to pass into the vital system. Into this soil, the roots (the absorbents) of the animal, strike. Hence, in the course of the passage of the absorbed fluid into the system, are elaborated (by the secreting apparatus) the materials that go to build up every structure, to renovate decay, to replenish exhaustion.

P.—Thus, it appears, that the plant with its suckers immovably fixed in the soil, and the animal with a bag wherein to *carry its soil about with it in all its changes of place*, are equally comprehended and cared for, in the beneficent provisions of that All-superintending Power, to whom no object is too minute for notice, and whose " tender mercies are over all his works."

CONVERSATION TWENTY-NINTH.

The function of nutrition—The vital elaboratiny process commences in the lacteal glands and absorbents—Chyle, when truly chyle?—Mastication, insalivation and deglutition—Benevolent design—Process of digestion.

DOCTOR.—THE function of NUTRITION in animals, in the most comprehensive sense of the term, implies the sum of those acts, and the complex agency, in consequence of which crude alimentary matters are broken up, dissolved, diluted, and strained—the organisable from the excrementitious—and so made fit for absorption, and the vital processes; and ultimately, being absorbed, are made part and parcel of the living solids and fluids.

PATIENT.—How would you arrange the natural series and sequence of these processes, from the preparation to the perfecting of the *pabulum vitæ?*

DR.—As follows:—1. *Mechanical reduction and trituration* by mastication, and the muscular movements of the stomach and bowels. The constant exposure of new surfaces to the solvent juices, on the one hand, and to the absorbent vessels on the other.

2. *Chemical solution and separation* by the salivary, gastric, biliary, pancreatic, and intestinal secretions.

P.—I should say, that these two processes, according to your views of the matter, are comparatively *subordinate*, at least, simply preparatory?

DR.—Do not mistake, however. If they be *comparatively* subordinate, they are nevertheless of the first and last importance. The object of the intestinal canal is *decomposition*—not in the sense of *destruction*—but the separation of the dietetic articles from their combination into their elementary principles. Here, as in the subsequent stages of the procedure, there is a sedulous care shown on the part of nature, to delay and dilute the nutrient materials in their passage into the system, and to give time for due elaboration and straining; so that no untempered, unfit, or immature substances, may enter into the composition of the living fabric.

3. *A vital elaborating process.* This is the function of the lacteal and lymphatic absorbents and glands. In this apparatus a perceptible and gradually advancing approximation of the food to the nature of animal substance is made.

P.—This, then, is the first grand scene of really *vitalising* operations?

Dr.—It is. *Chyle* is first here truly *chyle*. It merits not that appellation in the alimentary canal. There it *should* be called *chyme* throughout. For there is no such distinction between the nature of the dissolved mass in the stomach and that in the intestines, as to warrant a new name for the latter, and the name especially that appertains to the nutrient fluid when in a different part of the apparatus, and much more advanced in its elaboration, more subtilised and refined in its endowments.

Thus early objection is taken to the usual nomenclature of the pulpy mass in the intestines, because that nomenclature is based on false views of the change that actually takes place in such mass. At a time when it was supposed that increasing vivifying changes took place in the food as it traversed the intestinal track, the distinctions of *chyme* and *chyle* were allowable. But the sooner the name of *chyme* is retained for the alimentary mass of the small intestines as well as those of the stomach, and the name of *chyle* appropriated exclusively to the contents of the lacteal absorbents the better, and the more precise, correct, and physiological.

4. *Through admixture of the old and new blood* in the powerful apparatus of the heart, for this central organ of the circulation is a *churn* as well as a *pump*. This of itself is a step higher in the vitalising process.

5. The highest approximation to the nature of animal substance —the final vivification of the nutrient fluids—is effected in the lungs by contact with the oxygen and electricity of the atmosphere. Up to this point the new blood can scarcely be said to be *alive*, and the venous blood is for *all* vital purposes *dead*. The concluding process, therefore, is the completing, perfecting, crowning process of the whole.

P.—This arrangement of yours, I think, is as satisfactory as it is clear. I should now like you to pass in review *seriatim* the various steps or stages of *digestion proper*, or the functions of the alimentary canal, as you have more precisely restricted it.

Dr.—Willingly. We shall commence then with *mastication*, *insalivation*, and *deglutition*.

The *solution* of the food commences in the mouth. The secretion of the salivary glands are *solvent fluids*. The teeth are expressly for *comminution*, for breaking up the mechanical cohesion

of the particles of food, instruments to *tear*, to *cut*, to *grind*, as the nature of the food may require.

P.—The advantages of perfect mastication are, I conceive, neither few nor unimportant, and deserve to be placed in a strong point of view. To enlarge here, I think, is quite within the scope of our *conversations*, whose great end is to be *practical*.

Dr.—Well, I will detail these advantages at length. For the *duty* of mastication, &c., is one that people, otherwise very observant of their duties, require constantly to be reminded of.

1. It complies with the first grand requisite to *perfect* digestion. *It places the alimentary bolus in the most advantageous conditions for being intimately penetrated and mixed with the solvent juices of the stomach, i. e.*, by *disintegrating, softening, and diluting its particles.* The great importance and necessity of this preliminary operation in the reducing process of the food, will be apparent by a reference to the first laws and processes of chemistry.

P.—It is well known that chemical agents act more quickly and efficiently on dissolved than on undecompounded substances.

Dr.—Precisely. The disintegration of the particles of a body is an indispensable condition to its advantageous solution in a menstruum. To this end the chemist triturates his materials in a mortar before subjecting them to his digestive liquors. As a result of the same law, and on the same grounds, digestion proceeds much more slowly in substances introduced whole, or in large masses, into the stomach.

P.—Hence imperfect mastication, from defective instruments or hasty action, must be a frequent cause and great aid to any source of dyspepsia?

Dr.—It is; and is often thereby the simple but unsuspected foundation of distressing malaise of body and mind. Unreduced, undissolved masses in the stomach, act as foreign bodies, as irritants, provoking abnormal chemical decompositions, creating unwonted gases, and corroding acids in the alimentary canal; calling forth, in short, a baneful exhausting activity of secretion to wash out the offending matters, and to protect the visceral linings and the delicate nerves they enclose. By these means and efforts the healthy balance of the economy is disturbed, morbid processes are set up in the prime vital centres, and morbid sensibilities are superinduced in parts intended to know no sensation save those that are pleasurable.

P.—Thus by simple neglect, incaution, or ignorance, are the springs of life tainted at their very source.

Dr.—Yes; and what is worse, to make such a sacrifice often permanently to compromise the health, without the barter for it of pleasure, and without the excuse for it of temptation.

P.—One would say that *in this quarter*, in an especial manner, had nature provided for obedience to her behests.

Dr.—True; and it would seem that here, on that very account, she least brooks tampering, and most resents negligence.

P.—I believe that the bitterest of life's oft bitter draughts, the intensest cup of mortal misery, is generally drained by those who have most abused their stomachs by what I call *the three strong D's*—strong diet, strong drink, and strong drugs.

Dr.—There can be no doubt about it. But to proceed.

2nd. *Perfect mastication more completely gratifies taste.* This is not a consideration to be despised. If the Creator has seen fit to associate pleasurable sensations with the contact of the food with the sentient nerves of the mouth, shall man be wise above what is written in this page of nature's book? Can we lightly set ourselves above the gift, and the duty, and the pleasure.

P.—It seems very plain to common sense that nature by this provision of an adequate motive and stimulus to due mastication intended the act to be attended to. I think with you we cannot set aside nature's ordinances.

Dr.—Attention, therefore, to the behests of nature, to the gratification of taste, will always ensure due mastication. The more complete and exclusive this is the better. Hence the necessity, while chewing, *to chew only*. If the mind be so absorbed as to be either unconscious or indifferent, food is swallowed with little or no mastication, and lies for hours unacted on in the stomach, bootlessly tasking its energies, irritating its nerves, vitiating its secretions, and disordering its entire apparatus and operations. The more continuous and intense is the pleasurable consciousness associated with mastication, the greater likelihood there will be for perfect digestion, because there will have been the better preparation for it.

P.—An argument this, by the way, for having our food well cooked, and in the most savoury manner.

Dr.—Take care here: *use* very closely trenches on *abuse*. Plain, natural food, plainly, but well cooked, is always savoury to the healthy appetite; such an appetite especially as you see

produced by the water-cure. It is only the factitious or morbid appetite that solicts high seasonings and compounds of new and extraordinary *gout*.

But to proceed. 3rd, Not the least of the advantages of perfect mastication *is the regulation of the proper intervals of time for the admission of the successive portions of food into the stomach.* This is a more important consideration (as a means to perfect digestion) than is generally imagined, or than appears on the surface. The slow succession with which perfectly masticated morsels are necessarily swallowed is in remarkable harmony with a fact of gastric action discovered by Dr. Beaumont, *that each morsel on being received into the stomach is made to undergo a series of revolutions round its walls,* evidently for the purpose of saturating it with the gastric fluids. This operation lasted from 50 to 80 seconds; the precise time required for the thorough mastication of an ordinary bolus.

P.—May not this be an accidental or casual coincidence?

Dr.—I do not think so. To me it appears a pre-arrangement, affording another proof of the admirable forethought and design that characterises the plan of all animated structure.

P.—You have opened, then, a new ground, on which to make very striking to every one the injuriousness of hasty mastication and rapid deglutition, *that it compels the stomach to receive the successive morsels of a meal, more rapidly than is consistent with their proper disposal,* that is, with the proper action of the gastric solvent on each.

Dr.—You put the case truly. In this function, as in others of the animal economy, there is established a perfect co-ordination, harmony, and consent of action, between allied parts. Whatever disturbs this arrangement, *as the fault now commented on,* by producing abnormal action of the parts, can only conduce to disease in the long run.

P.—This is following out what you laid so much stress upon in the introductory conversations, that infringement of any of nature's laws or regulations, whether it be intentional or through ignorance, is followed by proportionate punishment. I know of no exception. Spirituous liquors will alike make the good or the bad man drunk; and headache and deranged stomach will follow, without respect of person, and according to the bodily condition.

Dr.—4th. Thorough mastication saves the stomach the needless

production of costly fluids, and therefore a wasteful expenditure of vital labour in disintegrating by maceration what ought previously to have been reduced by comminution. The increased vascular, nervous, and secretory energies, brought to bear on refractory and unreduced morsels, disable the stomach for the digestion of what would otherwise be easy, and to that extent robs the system of its due amount of nutrition.

P.—I am then to conclude, that from ill-masticated materials and the gratuitous digestive labour they impose, a smaller supply of nourishment is obtained, at the same expense to the organism, as a larger supply from better reduced, and more concoctable materials.

Dr.—Decidedly so. The morbid consequences of this state of matters are sure and speedy; disturbance of the nerves, impoverishment of the fluids, and depravation of the solids, will follow, more or less.

5th. *Slow mastication* (which, *cæteris paribus*, is perfect mastication) *ensures the appeasing of hunger, before more food is taken than can be easily digested.* The stomach is intended to receive only such an amount of food as can be easily mixed with the gastric solvents. These in the healthy person are poured out (as will be afterwards shown) *in precise proportion to the real assimilative need of the economy for the time being, not according to the voracity of the appetite, or quantity of food eaten.* When this definite amount of gastric juice secreted by the stomach in measure adequate to meet the definite waste and wants of the moment; when this is saturated with food, then all feeling of hunger subsides. Having prompted the satisfaction of the corporeal wants, the end of this vegetative instinct (hunger) is accomplished; its voice is silenced, its craving appeased. Not only all further desire for food ceases, but even its relish diminishes, and if ingurgitation be pushed much further, eating becomes absolutely disgusting.

How beneficent an arrangement! Another of those salutary *checks* of provident nature, by which she guards the *organic* from the abuse of the *animal* powers. Woe to the man who knows he has a stomach, and who habitually disregards the warnings of his stomach-conscience.

P.—Another conclusion I draw from your philosophy of this matter is this,—when the food is masticated and swallowed too rapidly, its impregnation with the gastric fluids does not, cannot take place, *pari passu*, as it is introduced; and the reason, it seems

to me, is very obvious—the cohesion of the particles is not sufficiently broken up, to allow the intimate insinuation and penetration of the gastric solvent among them. What then is the direct consequence?

Dr.—Your observations are perfectly just.

P.—What are the specific morbid consequences of this unseemly way of eating now on the tapis?

Dr.—At the end of a sufficient meal hunger is not appeased. The stomach has been gorged, perhaps, yet because the solvent is still *free*, unsaturated, the craving remains as keen as ever. Deceived by this, and *apparently with the best sanction of appetite*, the morbid eater eats till the stomach is often immensely overloaded. It needs no divination to tell the result of such a state of matters.

P.—Nature must succumb under her load; while, perhaps, the hapless dyspeptic bewails his lot as the most *innocent* of sufferers?

Dr.—Too true. The morbid condition so induced, is kept up and aggravated by every excess or new indiscretion of this sort. The whole tenor of the present conversation forcibly shows that it will be in vain that there concur all the *organic conditions* of perfect digestion, that is, healthy structure, healthy nervous power, healthy secretions, and healthy muscular movements, if *man's voluntary share in the business is wrong.* When we come to discuss the selection of food, modes of the preparation, the time of eating, &c., we shall see what further spontaneous errors of man disorder his digestive functions.

P.—I suppose it scarcely falls within the scope of these conversations, to give the anatomy and physiology of the teeth?

Dr.—No, we have only room for a remark or two. On the one hand, pecularities in the nature of the teeth have a reference to the nature of the food the animal subsists on; and, on the other hand, the whole construction and aptitude of the animal, its *habitat* and habitudes are adapted in turn to the nature of its food. In the carnivorous classes, for example, the teeth and jaws are more adapted for cutting and tearing than grinding. The herbivora, on the contrary, are deficient in teeth of that kind; the rest of their teeth are broad and uneven for trituration, and their jaws allow rotatory motion. Birds of prey have no mechanical means of reducing their food to the semifluid state to which vegetable substances require to be brought, in order to be acted on by the gastric juice. In them, the hard undigested parts, as bones,

claws, feathers, &c., are disgorged from the crop. The soft consistence and high organisation of animal food, increases its tendency to decomposition, and renders it easily soluble without a complex masticatory apparatus.

CONVERSATION THIRTIETH.

Insalivation and deglutition—Saliva, its properties and uses—Salivary apparatus—Passage of the morsel, its details and curious contrivances—Organ of voice placed in the midst—Proof of design—Taste and smell—Voluntary movements and acts—Reflex movements.

Doctor.—To-day we proceed with the subjects of *Insalivation* and *Deglutition.*

The saliva, as you know, is a frothy, watery, slightly alkaline fluid, largely secreted from the parotid, sublingual, and submaxilliary glands. The amount discharged and mixed with the food during a meal, varies from four to seven ounces. The latter may be considered an average in the adult. By reason of its apparent insipidity and want of strength, some writers regard it as of little consequence to the digestive process. That this is a hasty and groundless conclusion will appear from several considerations. 1st. A strong, *pungent,* or *caustic* solvent fluid *in the mouth* would not have answered the purpose of nature, would, in fact, have been out of place there.

Patient.—I should say would be horribly disagreeable to the individual, and therefore opposed to that beneficent arrangement for the happiness of the creature, that everywhere marks the handy-work of the Creator.

Dr.—Perfectly so. In the second place it is a mistake to imagine that strong agency is needed to produce great effects in the operations of nature. It is quite the contrary. The gastric juice, *which will dissolve bones,* is but a very diluted fluid. The saliva is more than a mere mechanical diluent. It is most probably one among others of the alteratives or solvents, all having their specific use and place in the economy of digestion. It shares a property, in common with the gastric juice, *of changing starch into sugar.* Very probably here commence those chemical changes in the

nutrient principles, that are completed in the alimentary canal. Accidulated saliva acts like gastric juice or azotised substances.

P.—Allow me here to put in for you a third head of remark; if such an apparatus as the salivary had not been necessary, would it have been placed there at all?

Dr.—The very *least* that can be said of the saliva, is this; that it guarantees one of the indispensible conditions of deglutition, and this, in itself, is no mean office; it moistens, softens, and lubricates the morsel.

P.—A preparation without which it could not be swallowed?

Dr.—The provisions for securing the abundant flow of the salivary fluids during mastication, remarkably exhibit that simplicity of design, yet efficiency of end, we have had, and will yet have so often occasion to notice, as characterising animal structure. 1st. The embedding of the glands among the muscles of the mouth. By the action of these muscles in chewing, an increased flow of blood is necessarily determined to them.

P.—How fine this is; these glands being furnished with the wherewithal for augmented secretions, precisely at the moment when their tribute is most needed, and must be paid.

Dr.—It *is* admirable. Again, by the connexion of the salivary apparatus with *animal* nerves, their secretions are brought under subjection to mental influences.

P.—By this, then, I perceive how it happens that the sight, smell, or even the bare *idea* of food, provokes the activity of the salivary glands. All this, I repeat, is very fine, all of a piece, one master-hand and master-mind reigning throughout, pervading and directing all.

Dr.—The tongue, the palate, the lips, the posterior curtain of the mouth (the soft palate), even the pharynx, are all largely supplied with nerves of *animal* life. The sentient papillæ on the surface of the tongue are visible. These are the immediate and especial seat of the sense of *taste*. This sense is diffused, but less intensely, over the internal surface of the mouth.

P.—What would you say was the great office of the sense of *smell*—a sort of sentinel to the alimentary canal, I presume?

Dr.—Yes; and a coadjutor to the sense of taste. Its *final* cause has evidently greater reference to its taking cognizance of certain qualities of the food, than to the performance of any other function. It is, therefore, placed in close relationship and contiguity to the mouth.

P.—I am anxious to know your exposition of the subject of

deglutition. Although I but inadequately comprehend the play of the parts concerned, yet from all I have heard, I believe no department of physiology is more replete with interesting details and curious contrivances.

Dr.—It is, as you affirm. But it is very difficult without dissections, to give you clear views of this admirable mechanism. Such as I can, however, I will impart.

While mastication is going on, the mouth forms a perfectly close cavity, or chamber, from which the food cannot escape. Behind it is walled up by the soft palate, whose lower edge is in firm contact with the base of the tongue; in this way all communication is cut off between the mouth and the gullet. Up to this boundary-line, sensation, volition, consciousness, and thought, concur in the digestive function; here the ministrations cease, beyond this digestion is a pure organic process. Nature *cannot afford* to leave any subsequent stage of the proceedings to the control of the will, hardly even to render it a subject of consciousness, and never so in the state of health.

P.—This instance establishes, still more clearly, your doctrine, that the Creator has, with a benevolent foresight for the well-being of the individual, removed from the government of *animal life*, the organs subservient to the grand *vital* functions, and has left them, therefore, to the operations of a *law* as undeviating as any of His other laws, moral or material.

Dr.—A remark quite in place, and quite *apropos*. In the whole of this introductory business to the grand solvent function of the alimentary canal, in the acts of eating and swallowing, we have an elaborate mechanism to deal with, that more than any other part of animal contrivances shows consummate design. We have an apparatus most multifarious in its parts, and most concentrated in its space, yet there is no crowding withal. We have apparently antagonistic operations, and incompatible adjustments, all to go on, and secured at one and the same moment, and by structures the most easily deranged, yet is there no interference of one part with another; there is not even an approach to jar, collision, or embarrassment. We have coarse, tough, tearing, cutting, grinding organs, bodies as hard and insensible as shears or mill-stones, placed in the midst of structures the most soft and sensitive; yet we do not find the exquisite perceptions and intimations of the latter in the least blunted or impeded by the rough operations of the former. It is provided for, at the same time, that this solid machinery shall neither be a source of irritation, nor incapable of

repair (nutrition). We have unfailing streams of fluid also supplying it, so that the operations of the mash-tub are combined with those of the mill. In the perilous passage of the gullet, in a narrow thoroughfare, with a crowd of openings, leading to the most important organs, and this, perhaps, a hundred times a day with every individual—there is a risk of the morsel regurgitating back into the mouth, or deviating into the nostrils, the air-passages, or the ear-tubes, an accident always annoying, sometimes fatal; yet is such an event the rarest possible occurrence. Last of all, and most wonderful of all, in the midst of combinations of mechanism so complex, and out of materials so heterogeneous and discordant, there is, nevertheless, devised *an instrument of divinest melody*—the vehicle of utterance to man's lofty thoughts, the medium of his sweetest associations with earth,—the herald of his high and hallowed aspirations to heaven.

P.—Will you describe the apparatus, and narrate the steps of the process of swallowing?

Dr.—To do this minutely would, perhaps, be tedious. The act itself is performed in an instant, almost with convulsive rapidity. The passage of the morsel must necessarily be rapid, as during the operation all access of air to the lungs is cut off. The whole is a beautiful illustration of *reflex movements*, movements performed independently of the will, and almost without consciousness. If you are curious on the subject, the following is the manner of the descent of the morsel from the mouth into the stomach.

1st. The bolus is collected upon the tongue, and carried up to the back part of the mouth.

2nd. By a peculiar organic sensibility, sympathy, and consent of parts, the curtain of the soft palate rises the instant the morsel is presented to it. A simultaneous action of the whole muscles of deglutition then follows with almost convulsive rapidity.

3rd. By the approximation and pressure of the tongue and palate, the bolus clears the palatine arch, and is thrust down into the fleshy tube, the pharynx.

4th. The muscles of the *anterior* palatine arch contract down upon the tongue after the morsel has passed, at once urging it forward and barring its return into the mouth.

5th. The muscles of the posterior palatine arch contract and approach each other like a pair of curtains, closing the nasal passages, eustachian tubes, at the same time contributing to propel the morsel forwards. The cleft left between the approximated palatine curtains, is filled up with the uvula.

6th. The larynx, or wind-pipe, is pressed forwards against the root of the tongue, which is carried backwards in delivering the morsel, a movement which flaps down the epiglottis * over the aperture of the wind-pipe.

7th. Along the inclined plane thus formed, the morsel slides into the pharynx, which is convulsively darted forwards to clutch it.

Lastly. The aperture being thus guarded on all hands, the morsel cannot but proceed straightforwards into the œsophagus, or gullet, whose successive contractions from above downwards, pass it by a series of undulations into the stomach. The entrance to this receptacle is guarded by its *sphincter*, which at the proper moment yields, and admits the passage of the bolus, in consequence of its consentaneous action with the movements of the gullet or meat-tube. The morsel once deposited in the stomach, the sphincter closes so as to retain the food. In vomiting, the *vis a tergo*, or reversed peristallic action re-opens this trap-door, which at all times else sacredly guards the return of matters from the stomach.

P.—This is all very clear; I now understand the whole.

Dr.—A reference to the wood-cut will make the apparatus as intelligible as it can be made, without the *subject* before us, and dissecting knife in hand.

CONVERSATION THIRTY-FIRST.

Digestive organs, their structure and mode of action—Pylorus (gate-keeper), its functions not hitherto clearly understood—Omentum, a reservoir or safety-valve for superfluous fat—Digestive viscera—Organic or non-sentient system of nerves—Evidence of design.

Patient.—Will you give me a brief description of the structure and mode of action of the organs concerned in digestion?

* A little valve or elastic lid which covers the *rima glottidis* (the chink of the windpipe), like the lids or keys over the apertures of wind instruments, as the bugle, &c.

Doctor.—With pleasure; I am at your service. But the configuration and relative situation of parts, you will best learn by a reference to wood cuts.

The stomach of the adult is capable of containing from one to two quarts. It is placed transversely across the upper part, and filling the *epigastric region* of the abdomen. *Above* it is connected with the diaphragm, which arches over it; *below*, with the intestines which form a floor on which it lies; *on the right* with the liver; *on the left* with the spleen. Its left end is considerably larger and higher than the right, and occupies the greater part of the left *hypochondriac region.* This end opens into the œsophagus, by what is termed the *cardiac orifice.* The small conical end of the stomach lies in the right *hypochondriac region,* and opens into the first intestine (the duodenum), by an outlet called the pylorus (gate-keeper), commonly, but erroneously, regarded as a *valve.* Between its two orifices are the *smaller curvature* above, and the *larger curvature* below. When distended the stomach distinctly rises, by revolving upon its attachments.

P.—The digestive passages in general I believe, are, composed of a series of tissues, coats, or tunics. Will you describe these?

Dr.—The stomach, like the œsophagus, and whole intestinal canal, is composed, 1st. of a Mucous Membrane; this constitutes the inner lining of all the canals and cavities of the body, which communicate with the exterior. In the quiescent, or empty state of the healthy stomach, it is of a pale pink colour, soft, and velvet-like, and covered with a thin transparent viscid mucus. In the tissue beneath lie the *crypts* or *follicles,* small oval glands that secrete the mucus. This membrane being highly distensible, is necessarily disposed into folds, when the bowels are empty and their cavity contracted. These are techanically called *rugæ* and *valvalæ conniventes.*

P.—What ends are secured by this arrangement?

Dr.—Various. 1st. It increases the extent of absorbing surface. 2nd. It allows space for the expansion of the membrane. 3rd. It affords full protection to the blood-vessels, nerves, and absorbents, whose delicate tissues would otherwise be injured by the occasional distensions to which these viscera are subject.

P.—I suppose that in the stomach, as the most distensible organ, and the most requiring to be so, these folds are larger?

Dr.—Yes; and more varied in direction. When it is distended they disappear. In the small intestines, the *valvulæ con-*

niventes are both more numerous and more permanent than in the others. Here their *final* cause is obvious—to increase the amount of absorbing surface.

The *villi* of the stomach and intestines may be likened to the *pile on velvet*. This is the best idea I can give you of this singular structure. Each shred or filament of the pile is a *villus*, containing its minute bundle or leash of blood-vessels, absorbents, and nerves. The villi of the small intestines are larger than those of the stomach. Four thousand are computed to a square inch! Their length is about one-fourth of a line. A lubricating and sheathing mucus is poured out along the whole intestinal track, to protect the delicate structures from the injurious action of irritant substances.

P.—You put much faith in the tongue as an index of the state of the intestinal coats, glands, and secretions. I presume these *villi* being the most superficial parts will present the most visible and tangible alterations in disease.

Dr.—True. In feverish states of the system, the villi become red and dry, or pale and moist, and lose their smooth and healthy appearance. The secretion of the villi is diminished or suppressed. The mucous follicles are flat and flaccid. The gastric juice also fails to be secreted.

P.—In such case, food or physic, I infer, will equally act as an irritant.

Dr.—They do. Hence the necessity, in such states, for entire rest of stomach. Nutritious drinks, as beef tea, which require no digestion, may be absorbed. But even here, the more solid constituents are not absorbed, and adhere to the stomach walls.

P.—This food again, I presume, remaining undigested, may increase the irritation of the alimentary canal, and aggravate the disorder of the general health.

Dr.—Your premises and your reasoning are both sound. The tongue, I repeat it, is a pretty sure index of these morbid states, and is generally to *match*. To understand the morbid indications of the tongue requires considerable attention to its appearance in a variety of persons and diseases.

2. The second layer or coat of the digestive canal is the *muscular*. The muscular action required in the intestinal canal is *propulsion*. According to the demand for muscular effort in the various parts of the alimentary tube is the amount of muscular fibre attached to those several parts. The fibres run lengthwise and across. The

muscular coat is thickest in the œsophagus and stomach; it diminishes in the small intestines; and is least of all in the large intestine, where the fibres are gathered into three separate bundles or longitudinal belts. In the rectum (the lowest portion of the bowel) they again become thick and strong, and continuous all round. I should remark that the stomach has an oblique layer of fibres in addition to its longitudinal and circular bundles. This is because of the greater variety of movement its function requires. The alternate contractions of these various fasciculi of fibres produce an infinite variety of movements, vermicular, peristaltic, &c. All acting simultaneously, they lessen the cavity of the stomach, and compress the alimentary mass, *compelling it, in fact, to make a circuit round the interior.* In this way the successive portions of the food are brought more entirely in contact with the solvent juices of the stomach.

In the case of the intestines, the effect of the combined contraction of the circular and longitudinal fibres is to shorten, yet dilate, the canal. These movements expose the dissolved alimentary mass in all directions to the orifice of the absorbent vessels, yet the while, gently urging its onward course. In this extended intestinal track, the fluid portion of their contents gradually disappears, until, at the termination of the small bowels, it is nearly all taken up by the lacteals.

P.—You say that the amount of muscular effort required in the various parts of the alimentary canal, is the measure of the thickness of the muscular fibres attached to those parts. If so, I infer that the thickness of the muscular coat of the digestive cavities, will bear a relation to the sort of food the animal habitually lives on.

Dr.—You are right. Those substances that require considerable muscular action and power in the intestinal tube, will proportionably develope its muscular coats. Food merely requiring solution, and therefore dispensing with powerful contractile efforts otherwise necessary, conduces to feebleness and inactivity of the muscular coat.

But I have not yet done with the muscular arrangements of the stomach. For about four inches from the pyloric extremity its fibres are gathered into a powerful, prominent, projecting belt, or ring, four times as thick as the muscular coat of the organ elsewhere. This is the point of *the hour-glass contraction* remarked by some writers, and the seat of those severe spasms of the stomach

to which dyspeptic patients are occasionally subject; pains quite refractory, in general, to all drug-medication, and which only yield when the spasm yields. I am not aware of any book of practical medicine, even the latest and best, in which the *real* seat of this distressing malady is pointed out. A fold of this muscular ring, and a thickening of the mucous membrane at the lower orifice of the stomach, constitute what is falsely designated the *valve* of the pylorus. This whole subject has been hitherto too superficially regarded by the profession. I shall tell you more about it presently.

P.—Well; will you proceed with the subject of the intestinal coats or layers of membrane?

Dr.—The outer coat of the alimentary canal is its *serous membrane*. The same lines the inner walls of the abdominal cavity, and is called the peritoneum. It also lines all the *shut* cavities of the body, as the joints, the cavity of the chest and outer surface of the lungs, the ventricles of the brain, &c. It is the investing membrane of the heart, within and without.

P.—What is the object of this membrane?

Dr.—It serves several important purposes. 1st. It forms a sort of curtain folded round the intestines, and extending to the back-bone; thus insulating each fold of the bowels, and keeping the whole in place. 2nd. It answers as a sort of web on which to convey the *immense number of vessels and nerves* that supply the alimentary canal. 3rd. By its moist lubricating surface it diminishes friction, and facilitates the movements of contiguous organs upon each other.

P.—There is a curious fatty membrane we see in slaughtered animals spread over the bowels. The *caul* or sweetbread I think they call it. What is its nature and use?

Dr.—Oh, the *omentum?* It consists of two folds of the membrane we are speaking of, connected by areolar tissue, and often containing, as you have noticed, much fat. It hangs like an apron from the arch of the stomach to below the navel, thus curtaining a large portion of the interior surface of the abdominal viscera.

P.—What is its use?

Dr.—Apparently only as a reservoir for superfluous fat; a waste spot, admitting of sufficient distension safely to stow away materials, of which it is necessary to relieve the circulation; and for whose elimination the common sources of excretion fail.

P.—I see; *that* you would consider, I suppose, a not overstrained hypothesis of the abnormal deposition of fat everywhere?

Dr.—It it pretty near the mark, I think.

The quantity of blood supplied to the stomach is greater than that to any other organ, save the brain. The vessels form two distinct layers—1st, an *external* one, that which is distributed on the peritoneum and muscular coats; 2nd, an *internal* layer, spread out on the areolar (cellular) tissue, and mucous tunics, forming a fine net-work on the *villi*. There is an intimate vascular connexion between the stomach and spleen, pancreas and liver. Their arteries spring from a common trunk.

P.—I presume the supply of nerves will be equally abundant with the supply of blood to the digestive viscera?

Dr.—It is. Most of them are from the *organic*, *ganglionic*, or non-sentient system. A few are from the *animal* or sentient system. The ganglionic nerves completely invest the great trunks of the arteries, and accompany them in all their ramifications.

P.—What is the office of these nerves, in your opinion?

Dr—Probably, if not certainly, something more than merely harmonising and associating the animal and vegetative functions, the hypothesis of some physiologists. If this were all their end, surely a lesser distribution would suffice. Incontestibly they control secretion, excretion, sensibility, &c.

P.—I think you before remarked, that they were not essential to impart secretory power, was sufficiently proved by the fact that plants, *which have no nervous apparatus*, elaborate secretions.

Dr.—True. The secretory process, therefore, is purely *organic*. But, in my view of the matter, it was necessary in the case of the animal *to make the energy of the secretory efforts to rise or fall with the varying demands and conditions of the system*. To *intimate*, therefore, to *telegraph*, if you like, these demands and conditions to the nervous centres and sources of power, and to fit the organic functions to work more slowly or quickly as the exigences of occasions require, is a sufficient reason for the introduction of *a regulating element* (organic nerves) in operations which in plants take place without any nerves at all. But organic nerves are not alone necessary for the *organic* operations. A certain intermingling of *animal* nerves is indispensable; and this in order to associate all parts of the body corporate into one grand whole, one confederation of allied interests—to establish one common centre of perception and inter-communication—which will register and notify the general weal or woe. This intermingling of the two grand classes of nerves, is the source of the pleasurable

consciousness of *health*—the feeling of physical joy and *bien être*, the buoyancy, vigour, and exhilaration produced by the well-being of the entire economy. The same medium gives us the painful consciousness of disease.

P.—I suppose it is by the same distribution of opposite classes of nerves, that the stomach is brought into immediate connexion with the grand centres of animal life; thus explaining the intimate sympathies and important relations of this organ with every part of the system.

Dr.—Quite correct. Otherwise, for the *specific function* of the alimentary canal, it is wisely and mercifully ordained, that it be provided almost exclusively with *organic nerves*. Nevertheless, for the reasons specified, and for other reasons also, an intermingling of some *animal* nerves is requisite, in the apparatus ministering to the nutrition of the individual. For example, the control of the voluntary powers over the reception of food, and the exit of its refuse, imply intimate relations with the sentient nervous system, and necessitate the distribution of its nerves on the parts concerned.

CONVERSATION THIRTY-SECOND.

The alimentary canal—Duodenum—Jejunum—Ilium—Valvulæ conniventes—Villi—Lacteal glands—Lymphatics—Receptaculum chyli—Thoracic duct—Colon—Ilio-cæcal valve—Rectum—Liver—Vena portæ—Series of preventive checks, *instituted by nature for the preservation of the individual.*

Patient.—Will you give me some account of the digestive tube, from the stomach downwards?

Doctor.—The small intestines in man are about *four times* the length of the body. They are artificially divided into the *duodenum*, *jejunum*, and *ilium*. We have already referred to the *valvulæ conniventes*, the deep semilunar folds of the inner lining of the intestines. They are so numerous that each is laid upon the other like scales upon a fish, or tiles upon a roof. The small intestines as they descend gradually diminish in capacity, in

thickness, in vascularity, in the size of the villi, and in the depth and number of the *valvulæ conniventes.* They contain a prodigious number of minute glandular follicles, with groups of glands of larger dimensions. The glands of *Brunner* in the end of the duodenum, and the beginning of the jejunum, and the glands of *Peyer* in the ilium.

The length of the *duodenum* is conventionally of twelve fingers breadth. Hence its name. It is perhaps the most important portion of the small intestines. Into this portion of the bowel, the common biliary and pancreatic ducts pour the tribute of their secretions, at about four inches from the pylorus. Here, therefore, the alimentary mass is subjected to new chemical processes. The duodenum is closely tied down to the back by the peritoneum, which only imperfectly covers it. Hence this part of the viscera is incapable of much motion. The *jejunum* consists of about two-fifths of the small intestine. It is generally found empty. Hence its name. The *ilium* is about three-fifths of the length of the bowel. The small intestines expand into the capacious COLON, at a right angle, about four inches above the lower extremity of the latter. The opening of the small into the large bowel here, is guarded by a circular fold of mucous membrane, called the *Ilio-cæcal valve.* Its loose border floats into the large intestine, so as freely to admit the passage of matters in the descending direction, *but to bar their return.* The part of the intestine (or lower extremity of the ilium), below the ilio-cæcal valve, is called the *cæcum.* It constitutes a capacious sac or pouch of nearly four inches in every way. It is situated in the right flank (iliac region).

The "*ascending*" portion of the colon occupies the right iliac and hypochondriac region. Its "*transverse arch*" extends across the epigastrium. The "*descending*" division of the large bowel traverses the left hypochondriac region. The "*sigmoid flexure*" is placed in the left iliac region, and terminates in the "*rectum,*" which is placed in the hollow of the sacrum, and follows its curvature. A set of circular fibres are accumulated around the extremity of the bowel to form the *internal sphincter ani,* and another set of external circular fibres form the *external sphincter.*

The large bowel, or *colon,* is not a cylindrical canal, but is gathered into partial circular folds, which gives it a sacculated form and appearance. This arrangement retards the descent of the fæcal matters. The colon is secured by three longitudinal

bands, which disappear in the *rectum*, or termination of the great intestines. Here, also, the sacculated form of the tube is lost and it becomes uniform and cylindrical. The mucous membrane of the rectum is plaited into large transverse folds in order to admit of the distension of the bowel with feculent matter.

P.—From your account of the office of the *lacteals*, I am much interested in these vessels; will you describe them to me?

Dr.—They are delicate, pellucid, membranous tubes, the proper absorbent vessels of the alimentary canal, and elaborators of the *chyle*. They commence on the *villi* by cells too minute to be visible to the naked eye; they are most abundant in the small intestines, and are nourished by blood-vessels and nerves, but the transit of their contents is not in consequence of inherent contractile power, or *vis a tergo*. They are spread out in a minute net-work on the mucous membrane; thence issue branches of a larger size, which pierce the intestinal tunics, and emerge upon the mesentery. Within the folds of the latter they coalesce and form a very complex web. Here the *lacteal glands*, little coils or knots of vessels and nerves, are thickly scattered, or rather arranged in two distinct rows; the outermost is the larger. From these the lacteals converge towards the spine, successively forming longer and larger branches, till at length they constitute two or three principal trunks, terminating in a small oval sac—the *receptaculum chyli*, which rests on the first or second lumbar vertebræ. In the reservoir also terminate the trunks of the *lymphatics*, which are the *special* absorbent vessels of the system, as the veins are the general absorbents. They convey back from all points of the body towards the heart the lymph and serum exuded into the meshes of the areolar tissue from the skin and mucous membranes, from the internal cavities and vessels, and from the substance of all the organs. The glands of the lymphatic system are composed of an inextricable knot of vessels.

P.—Are they for the further elaboration of this matter, previous to its mingling with the chyle, and its being thence restored to the general current of the circulation?

Dr.—This, I think, can hardly be called in question. From the receptacle of the chyle proceeds the *thoracic duct*. This is a transparent tube of nearly the calibre of a crow-quill. It rests on the spinal column, and ascends into the chest on the right side of of the aorta up to the fifth or sixth dorsal vertebra. It here crosses over to the left side, and proceeds as far as the sixth cervical

vertebra, where it bends down to plunge into the angle formed by the junction of the internal jugular and left subclavian veins. It is thence sucked in by the venous torrent that is rushing to the heart. At the point of entrance two valves are placed which prevent the regurgitation of the chyle, or the inlet of the blood into the duct.

P.—In matter of design, here are ample subjects for admiration. How minutely careful are the precautions of nature to guard the organism from damage at all points. Not a loop-hole is left without its due guard against the entrance of an invader. Will you now give me some account of the LIVER?

DR.—The liver is the largest and heaviest gland in the body. For the blood it is designed to purify (that from the venous capillaries of the whole abdominal or digestive system) is often highly charged with foreign and noxious elements. It weighs about four pounds on an average. It lies chiefly in the right hypochondriac region (under the false ribs, where its margin is felt), and extends across the epigastric region (stomach pit), into the left hypochondrium. Its upper surface is in contact with the diaphragm; its under surface with the pyloric extremity of the stomach.

The veins arising from the stomach, spleen, pancreas, omentum, small and large intestines, run together to form a large venous trunk—the *vena portæ*—which plunges into the liver, where it gives off branches in the manner of an artery. The ultimate ramifications of these, terminate in the biliary ducts. This constitutes the famous PORTAL SYSTEM—a beautiful contrivance of nature to receive and purify the twice-tainted blood of the abdominal viscera, before it reaches the heart.

P.—How twice-tainted?

DR.—I say, emphatically, this blood is *twice-tainted.* First, in common with other venous blood, it is *spent* by the renovation of structure, and the pouring out of secretions and exhalations. Second, it is charged in addition with all those crude, impure, indigestible, or superfluous fluids absorbed from the alimentary canal, and which must not be permitted to pass into the vital commonwealth. Foreign substances so absorbed are readily detectable in the liver and spleen—and this, when even no traces of them can be found in the thoracic duct, or in the general circulation.

P.—The great object and office of the liver, then, is to filter and strain off the impurities thus accumulated.

DR.—Precisely. The product of this operation, bile, which is

primarily and essentially an excrementitious matter, nature thriftily turns to account in the process of digestion, before it is finally disposed of.

The *vena portæ* holds the same relation to the biliary ducts that an artery does to the excretory ducts of other glands, and forms by far the greatest part of the vascular substance of the liver. The two hepatic arteries are small, and simply for the nourishment of its tissues. Their ultimate divisions terminate in the vena portæ. The innumerable branches of the biliary ducts, converging from all parts of the liver, at length form a single trunk, called the *hepatic duct*, which carries the bile partly to the *gall bladder* (by the cystic duct), and partly into the *duodenum* (by the choledoch duct). The choledoch is the common trunk of the cystic and hepatic ducts. These points of the anatomy of the liver will perhaps be made more apparent by a reference to the wood-cut.

So much for the generalities of the liver. The questions relative to the office of the bile will come in for discussion by-and-bye.

P.—The purport of your discourse on the digestive organs so far is this, that we have, in the whole of the abdominal apparatus, an admirable *series of checks* instituted by nature, to prevent the contamination of the general circulation and the vital centres, by the introduction of foreign or unassimilable matters. Resume me these, if you please, or define me this idea more clearly.

Dr.—The *first check* is the function of the bowels by which extraneous matters are strained off from the nutritious.

The *second check* is the filtering process of the liver, by which subtler impurities absorbed by the veins are eliminated before they can reach the grand head (or heart) quarters of the organism.

The *third check* is the function of the kidneys; organs evidently placed where they are as an adjunct to the digestive economy; a strainer of materials injurious to the system from their excessive amount or noxious qualities. Many facts show that the excess of fluids received into the stomach is let off by the kidneys, without the necessity of their making the whole circuit of the body.

Sound analogy, and *à priori* reasoning, support such a supposition. But, in point of fact, an anatomist (Lippi) has demonstrated a vascular connexion of the veins and lymphatics of the liver with the kidneys, by which superfluous dietetic matters, or injurious medicinal substances received into the system, are summarily disposed of.

P.—Herein and hereby, I should think that the mischiefs of your three D's—strong diets, strong drinks, and strong drugs—are neutralised.

Dr.—At least *mitigated* to the furthest extent nature could go, that is, by providing an apparatus for their elimination before they were finally received into the grand route of the circulation.

The *fourth check* is the lacteal elaborating apparatus. The best of the nutrient materials are only received and turned to account here.

The *fifth check* is the eliminating process of the lungs; the great drain of the superfluous *carbon* of the body.

P.—This analysis of the digestive apparatus, including the whole economy of the abdominal viscera, certainly proves that nature has more providently cared for the health and continued existence of the animal than would at first sight appear.

Dr.—Yes; but for such contrivances, the life of animals, especially of *man* (the *all*-eating and drinking animal), would be infinitely shorter and more uncertain than it is. *The victims of the belly*, numerous as they are, would be ten thousand for one.

P.—You would make it out, then, that poisoning voluntarily, by the alleged "good gifts of God," would be the order of the day?

Dr—Something near it.

P.—Well; you have almost forgotten the pancreas and the spleen; organs I have heard you occasionally refer to. What of them? Tell me something of their place, and interesting of their functions?

Dr.—Of the PANCREAS little need be said. It is a small organ, closely resembling the salivary glands in structure and secretions. It lies behind the stomach and across the body. It is about six inches long, and one thick, and weighs from four to six ounces. Its secretion is poured into the intestine by a common mouth with the biliary duct. It is eaten as a *bon bouche*, under the name of *sweetbread*, but it is a mistake to suppose it so easy of digestion.

The SPLEEN is situated in the upper and back part of the abdomen, on the left side, between the diaphragm and left kidney. It is connected with the diaphragm, the stomach, and the colon, by vessels and loose folds of the peritoneum. It is composed entirely of blood-vessels, lymphatics, and cells, on a fabric

or basis of areolar tissue. It is about four inches long, three broad, and one in thickness, and weighs about eight ounces.

P.—What is the specific function of the spleen?

Dr.—*That* is a point still *sub judice*. This at least is established, that it serves as a diverticulum or reservoir for the excessive supplies of blood the *molimen digestivum* from time to time exacts for this part of the animal organism. When this *molimen* subsides, and the digestive function is accomplished, a vent, of course, is required, whereby to ease the gastric apparatus of an excess of blood now no longer necessary. This, at least, is the most feasible hypothesis of the spleen.

This much will suffice for a glance at the apparatus concerned in digestion. In our next conversation we shall enter on the exposition of the processes themselves, by which food is made fit for absorption into the *vital* system, and for assimilation to the vital fabrics.

CONVERSATION THIRTY-THIRD.

Stomach—Its mucous lining—Process of digestion—Gastric juice, how and when secreted—Illustrations of reflex action—Progress of the swallowed morsel—Influence of mental emotions on digestion.

Doctor.—The stomach in the healthy state, when empty, is coated with a thin, transparent viscid mucus, nearly, if not entirely, destitute of acidity. On the introduction, however, of food or a foreign body (any simple mechanical irritant), myriads of bright translucent watery specs, distinctly acid, ooze through the transparent mucus, from the fine *villi*, or vasculo-nervous papillæ of the stomach walls. These collect in drops, which burst and diffuse themselves in limpid rills over the whole interior surface; yet the apertures of the vessels are invisible. *This is the gastric juice.* It is secreted from numberless vessels, distinct and separate from the mucous follicles. When collected, it is transparent, inodorous, saltish, acidulous. It consists of water, containing free hydrochloric (muriatic) and acetic acids, with phos-

phates and muriates of potass, soda, magnesia and lime. The gastric juice coagulates albumen, and is eminently *antiseptic*, that is, corrective of putridity.

The gastric juice is secreted in great abundance the whole time digestion is going on. None is found in the empty stomach. *It is a true chemical solvent,* and the principal agent of the reduction of the food in the stomach. It is a law of all chemical solvents that they can only combine with, or decompose, a fixed, definite amount of any given substance. The gastric juice is no exception to this law. With infinite beneficence and provident care for the well-being of the individual, the Creator has so ordered it, *that this secretion is only yielded when needed, and in measure, according to the alimentary need of the economy for the time being, and not according to the quantity of food ingested.*

PATIENT.—It seems, then, that there is no provision for digesting any excess of food above the wants of the system?

DR.—No. Nature, as thus interpreted, gives no place to the exorbitant requirements of gluttony, and yields nothing to the caprices of wayward appetite, which are all morbid cravings in their way; she makes no provision, in short, for digesting any excess of food, above the real wants of the economy, as you properly infer. Whatever is beyond the saturating point of the gastric juice, is unoperated on, is undissolved; and, therefore, becomes subject to decomposition. Hence the generation of gases, acidity, and other symptoms of dyspepsia.

P.—In fact, you would consider all such excess of food above the disposable powers of the gastric juice, as so much foreign matter in the stomach and intestines, lying a load, producing discomfort, creating disease?

DR.—There can be no question of it.

P.—How is such excess of food eventually disposed of?

DR.—Part passes off by the bowels; a part of the oil passes into the lacteals, and so into the system, to be burnt off in the lungs, or stowed away as adipose tissue, and a part of the albumen and fibrine is absorbed by the veins, and is eliminated by the kidneys. *Waste*, that is, corporeal exertion, &c., by reproducing *demand* in the economy for the materials of sustentation, will originate fresh stores of gastric juice to meet the demand.

P.—In this is apparent the benefit of exercise in improving the digestive powers.

DR.—A parallel fact to the above great law of digestion, the

alimentary economy, must here particularly be impressed upon your memory:—That *the gastric juice is never secreted while fasting,—never accumulates in the intervals of digestion, so as to be ready for the next meal.*

There is reason to believe that the amount of intestinal juices poured out on the reception of a meal, is much greater than is usually supposed. During a repast a great influx of blood takes place to the vessels of the stomach. Its colour alters from a pale pink to a deep red, its temperature is elevated, and its nervous power exalted. The *villi* enlarge, and the gastric juice, exuding in great drops, trickles down in limpid streams over the whole interior surface. The exudation of mucus is correspondingly active. These secretions are favoured by a certain quietude of body after a meal; inasmuch as the powerful determination of blood to the digestive surface is not then interfered with.

P.—It was an old opinion that digestion did not commence till after the completion of a meal. I suppose that idea is not correct?

Dr.—It is quite erroneous. Digestion begins with the introduction into the stomach of the first mouthful of food, and its solution in the gastric juice.

P.—Dr. Beaumont, who experimented on the Canadian, the interior of whose stomach was exposed by a gun-shot wound, made some curious observations on the motions of the stomach, and on the food it contained.

Dr.—He did. Each bolus on being received into the stomach, makes a complete circuit of its cavity. It first turns to the left, descends into the splenic extremity, and follows the great curvature towards the pyloric end; it then returns in the course of the smaller curvature. The muscular bands woven into the walls of the stomach are so arranged, that their contraction shortens its diameter in every direction, and induces an infinite variety of movements. The contraction of the transverse bands produces vermicular and peristaltic motions. The effect of the action of the longitudinal fibres is to approximate the splenic and pyloric extremities. All contracting simultaneously, they lessen the cavity of the stomach, and compress (*churn*) the contained aliments, compelling them to revolve round the interior. These revolutions occupy from fifty to eighty seconds. They are evidently designed to ensure, 1st. The thorough saturation of the alimentary mass with the gastric secretions. 2nd. Its further disintegration and

solution. 3rd. The absorption of its more fluid portion. While these revolutions are being accomplished, until the contractions of the organ be over, the stomach closes against the entrance of another bolus, and it is received with evident effort as untimely. When each bolus has performed its revolutions, it is deposited in the left or cardiac portion, or great end, of the stomach. Then there is a pause in the movements. The muscles relax in a degree, and the organ prepares for the reception of another bolus, in its turn to go the same rounds. Unless the morsels follow in too rapid succession (as in the case of *bolting*) this process continues till the stomach is distended with food, or the meal finished. Then a gentle undulatory or vermicular motion succeeds, and is maintained so long as stomachal solution, or *chymification*, is going on. This dissolved substance, or *chyme*, is nearly uniform in appearance and identical in qualities, from whatever sort of food, vegetable or animal, it is obtained. It is a homogeneous, pultacious, greyish mass, faintly sweet and acid, or mawkish to the taste. *Pari passu* as the solution goes on, or as the process of digestion advances, the muscular movements, probably also the secretions, are more energetic, and the alimentary mass more acid and stimulating. The chymified matters are gradually propelled forwards through the pylorus into the intestines. As the bulk of the alimentary mass diminishes in this way, the movements determining towards the pylorus increase, and the dissolved portions make their way into the duodenum with proportionate rapidity.

P.—What is the average time of a *moderate* meal lying in a healthy stomach?

Dr.—From three to five hours. These movements of the stomach, the organic appreciation of its appropriate stimuli which they indicate, and the organic response to it, which is called forth in the corresponding actions of the organ, are beautiful illustrations of the *reflex or excitomotory function*. The *afferent* nerves report at the spinal centres what is needed, and the *efferent* nerves, on the instant obeying the summons, send forth the power to originate and maintain the requisite actions.

P.—Do you think that *mental emotion interferes with digestion, by suspending or deranging those gastric movements?*

Dr.—It is a highly probable hypothesis. I believe so. This at least is certain, that *mental emotion alters the secretions* as one prime element of the derangement in question. The facility of the stomach's functions, when the mind is happy, and the difficulty of

its operations, when the mind is harassed, are familiar facts. On the other hand, the influence of unsound digestive actions over the mental states is reciprocal.

It is probable that by the time the last mouthful of a moderate meal is swallowed, if mastication has been long and perfect, and, therefore, the reception into the stomach at slow intervals, the whole quantity of gastric juice necessary for its complete solution has been secreted. The softened layers of the pulpy mass are in succession removed by the propulsive actions of the stomach and carried to the pyloric end, whence it passes into the duodenum. The harder, deeper-seated, less saturated, or undigested masses of food, by degrees come to the surface, to be exposed to the action of the solvent fluids. These are softened and dissolved in turn, and in like manner are removed to the pylorus. In this way the process goes on till digestion is completed.

P.—What is presented on opening the stomach of an animal three or four hours after a meal?

Dr.—The solvent power of the gastric juice is then made apparent. The portion of food in immediate contact with the stomach is wholly dissolved and detached; the next layer in process of solution, and the central mass is unchanged. I think it can hardly be questioned but that the portions of the food first received into the stomach are the first to be chymified, and passed out; and so each successive layer is brought into prolonged contact with the solvent fluids. There can also be little doubt but that the successive morsels of a meal, more especially in dyspeptic stomachs, are deposited each *within* the previous layer, so that the portions last received constitute the innermost or central layer. Thus it is provided for, that the order of the exit of the morsels from a stomach will be the order of their entrance; that which is last received being the longest retained, unless it be more readily digestible than previous portions of the meal. In the event of refractory materials in a meal, they are kept to the last, in order to receive the *further measure* of gastric juice and stomachal movement, necessary to their complete solution and final descent into the intestines. This detention of unprepared morsels is in consequence of the peculiar sensibilities of the pylorus, which are almost equivalent to the endowment of reason. *It knows to choose the good, and refuse the evil.* In this way also, it will occur, that if one meal be received before the digestion of the preceding be completed (as too often happens), the two

portions will be kept distinct, the new food occupying the centre of the old. Dr. Beaumont affirms that there is no line of separation between the old and the new food, and that the whole contents of the gastric cavity, crude and chymified, lumpy and dissolved, hard and soft, coarse and fine, were blended in one heterogeneous mixture. But herein I deem his observations defective, his conclusions doubtful. *The experimental test was not applied by him;* in its absence I hold to my own tests, and *à priori* probabilities. From many observations and experiments made on my own once feeble stomach, I believe I may differ with him on sufficient grounds. This much, however, may be conceded, that in the case of a *very light* and simple meal, the stomachal agitation and trituration may produce a perfect admixture of the whole ingesta.

CONVERSATION THIRTY-FOURTH.

DOCTOR.—TO-DAY I will attempt to expound the function of the pylorus, or lower end of the stomach, and the true rise of the singular *muscular belt* around that part of the organ.

PATIENT.—This is a *terra incognita*, in my humble opinion, to the unprofessional public, at least.

DR.—Even by the Profession, as I conceive, it is very inadequately comprehended, *if not entirely misapprehended.* As this portion of the alimentary canal is replete with pathological interest, is, in fact, "the head and front of the offending" in many of the wide-spread stomach maladies of the present day, its discussion must not be lightly treated or slurred over. I have bestowed much of my analytical meditation on this interesting point, and fairly encountered its difficulties. Its mystery, hitherto, may perhaps, be found solved.

P.—If you are fortunate enough to do this, I doubt not, but that a new and unwonted light will be thrown on the pathology of the "proteus-fiend," as *dyspepsia* was baptised by some writer; and, perhaps (if I be not too sanguine), the foundation laid for an improved and more successful practice than heretofore?

Dr.—A more successful practice than heretofore *has been founded*, and should any of your medical friends, *devoted to science and humanity*, doubt it, let them come here and see for themselves. But to continue; the multiform shapes this disease assumes, and the cruel sufferings it inflicts, made it be so designated by a popular writer at a time, not very remote, when fictions were too generally substituted for facts in physiology and pathology.

P.—When the practitioner, I suppose, was almost as much in the dark as the patient regarding the true seat and nature of the disease?

Dr.—This surmise is too true. At a subsequent period of these conversations, we shall fully discuss the pathology of the stomach. At present any details of the morbid conditions of the stomach are merely incidental to, and elucidatory of, its physiology.

P.—Well, will you proceed with your exposition of the function of the pylorus?

Dr.—During the *later* stages of digestion especially, the stomach observed in the living animal is seen forcibly contracted a third of its length from the pylorus, making a clear division of the cardiac and pyloric portions of the organ. In the case of Dr. Beaumont's servant, before referred to,* the bulb of a long glass thermometer-tube, being introduced through the aperture far down into the pyloric portion of the stomach (when the digestion of a meal was advanced), was always arrested at this point. Then a relaxation took place, in which the bulb *was forcibly sucked in* (swallowed?) three or four inches towards the pylorus. It was then relaxed and forced back, twirling the tube about. When the whole length of the tube was allowed to slip into the pylorus, it gave strong resistance in drawing back, precisely like pulling a piston out of an exhausted tube. This resistance ceased as soon

* Alexis San Martin, a robust Canadian of eighteen, received, in 1822, a gunshot wound, which carried away a portion of the walls of the abdomen, and left a fistulous opening into the stomach. He was engaged by Dr. Beaumont, of the United States' army, as a servant, at various periods between 1825 and 1833, chiefly with a view to the prosecuting a series of experiments on digestion. For the new facts Dr. Beaumont has contributed, science and society are equally indebted. Nevertheless, it is to be regretted that more was not made of so fine an opportunity of clearing up many of the obscure points regarding the action of the stomach on aliments. The majority of his experiments are indecisive in manner and very indefinite in result;—many very coarse and slovenly from want of care to exclude falsifying elements; and some interesting questions that might easily have been settled, not even touched upon. As it is, we have only approximative results (as, for example, on the relative digestibility of various sorts of food), where we might have had certainty.

as relaxation occurred, and the tube again rose spontaneously three or four inches, when the bulb was again caught in the grasp. If pulled up an inch or two out of this pyloric *gullet* or *rectum* (for such it is truly in structure and functions), the thermometer-tube once more moved about freely in all directions, but mostly inclined to the splenic extremity. Simultaneously with the contractions there was a general shortening of the gastric cavity, and a forcible compression of its contents. On the relaxation occurring, the *rugæ* are seen performing their vermicular motions, and the alimentary mass making its circuit of the walls as before. The circular or transverse fibres contract progressively from left to right, propelling the chymous mass forward in the same direction. The transverse pyloric belt takes up this peristaltic movement, and contracts powerfully upon the mass brought forward to the small end of the stomach. In the strain and pressure of this true rectum or gullet-like action, the thinner chymified portion is rubbed off, and squeezed through the pyloric vent into the intestines. After a portion of the contents have thus been protruded through the pylorus, there is quiescence for a moment—the circular band and the transverse muscles relax. Then the contractions recommence from right to left, carrying the alimentary mass back to the splenic extremity. These peculiar contractions and relaxations succeed each other at intervals of two, three, four, and five minutes; but more rapidly as the process advances. Towards the end of digestion the volume of the ingesta diminishes with disproportionate rapidity. *It is the first and fundamental law of the stomach's action that it cannot be at rest, so long as food, physic, or any foreign matters are contained in the cavity.* The *dissolving, mixing, triturating, evacuating* process goes on, must needs go on, till the stomach be empty. Then all is quiescent again.

P.—I should think that the experiment with the thermometer being too frequently repeated, or the bulb being too long retained in the pylorus, would strain and injure the part?

Dr.—It did so; severe distress, cramp, or spasm, *with tenderness at the stomach pit*, were induced.

P.—But how do the proceedings in these experiments, and the facts of gastric movement now detailed, bear on the *real* function of the pyloric extremity of the stomach?

Dr.—These proceedings and facts, with certain familiar pathological cases, in my humble view of the matter, do not any longer involve the function of the pylorus in either doubt or darkness. As error must be demolished before truth can be established in its

place, it is necessary to remark *in limine* of this exposition, that *the pylorus is not a valve*, as it has so generally been regarded and called, even by the best and latest writers.

P.—*Is not the office of a valve to admit exit but to bar entrance?*

Dr.—You have it precisely; you have "hit the nail on the head." *This is not the case with the pylorus.* In the mechanism required by this part of the structure, *provision must be made to admit regurgitation from the duodenum into the stomach* (as in the common case of vomiting), *and the introduction of bile also* (as when an excess of oily matters has been eaten). *Here a valve would obviously have been out of place, would not have answered nature's purpose, would, in fact, have been subversive of her ends. No; the pylorus is truly a sphincter;—the broad transverse belt of muscle above it, is equivalent to the thick muscles of the rectum; and the function of the parts is analogous, that is, a means, 1st, of forcible retention of the contents of the cavity till their preparation or accumulation is sufficient to require emptying; and, 2nd, of propelling the matter through the pyloric sphincters, when it yields, as the contraction of the rectum forces matters through the relaxed sphincter ani.*

P.—The analogy, then, you make out, of these two parts, is complete; as regards, on the one hand, their physiological function, and, on the other, their mechanical action.

Dr.—Yes; and what is still more curious and significant, their diseased states. But to refer specifically to each point of the analogy of the organs in question, the pylorus and rectum;—

1st. As regards their *physiological function.* They are a means of retention of the contents of their respective cavities, till they undergo certain preparation, or increase to a certain amount, and then they become instruments of propulsion and expulsion.

2nd. Touching their *mechanical action.* In both cases—by that harmonious play of associated parts that we find everywhere in animal structures—the orifice relaxes as the muscular band above contracts, and *quite in the measure the one of the other.*

P.—I perceive it now clearly. This consent of action between the pyloric *belt* and the pyloric *vent*—between the energy of contraction on the one hand, and the extent of dilatation on the other—makes very understandable (now that the true light of the function is let in upon my mind) some points of its pathology, on which popular, if not professional, ideas are very vague and confused. For example, the *malaise* complained of by certain dyspeptics some time after a meal, when it may be supposed to be

leaving the stomach—that is, in process of *swallowing* by this pyloric throttle.

Dr.—You have got the clue, and I am glad to see it serve you so well in unravelling what was before perplexed. These applications of abstract truths I shall advert to immediately.

3rd. The *third* point of analogy between the pylorus and rectum refers to *their diseased states.* 1st. *Functionally:* the retentive or the expulsive power may be in excess or defect; the action of the parts may be too hasty or too halting; admitting premature exit of the contained matters (as in *bulemia*, the disease of gluttons), or unduly delaying exit and embarrassing operations, as in dyspepsia. These last cited functional derangements of the pylorus, have their precise analogues in the rectum. 2nd. *Organically:* these two compared parts coincide in being the situations, *par excellence*, the chosen seats, wherein *structural alterations* of the alimentary canal occur, from simple affections of the mucous membrane to cancerous degeneration. The relaxed gastric mucous lining and turgid veins of some dyspeptics have their precise analogues and accompaniments in *piles*, *pains*, and the irritation and uneasiness they produce. The two exits are also united by great sympathy. Pyloric irritation is often the cause of sore throat—another sympathy.

P.—I want your views more in detail, respecting the practical application of this doctrine of the pylorus.

Dr.—Now you are in a condition, as you have shown, to understand the *embarras* and *malaise* of the *molimen digestivum* in dyspeptics, and *how they are principally felt in the latter stages of the process.* The case is precisely that of a costive evacuation with a tender, congested, or abraded rectum—neither more nor less. Now only figure to yourself, *mon ami*, the poor pylorus being put through a cruel torture of the same kind—by a gormandising or indiscreet dyspeptic—if only for a few hours every day. In the state of health, and with a *moderate* and wholesome meal, there is, there should be, no consciousness of having a stomach. The gastric juice is poured out in sufficient quantity for the thorough solution of the food, either at the time of the first ingurgitation of the morsels, or during their subsequent detention in the stomach.

P.—In most cases of impaired digestive power, is the fault defective quality or quantity of the gastric juice?

Dr.—Generally both, that is, in cases simply *functional*, or before organic lesions have arisen. In acute cases, and in those of advanced visceral disorganisation, the symptoms of *malaise* commence

with the first introduction of food. In the majority of cases of simple dyspepsia, where no excess has been committed, the *malaise* is only felt in the *later* stages of digestion.

P.—From your whole statement of the case of the stomach's function, it is reasonable to suppose that what gastric juice is at the disposal of the economy *is poured out in the commencement of digestion.* Hence the solution of the *first* portion of a meal, at least, will be guaranteed.

Dr.—Your conclusions are quite reasonable, save in the cases of very disabled stomachs, or very intractable materials. Then subsequent doses of gastric juice may be requisite before a meal is finally discharged from the gastric cavity. Hence the advantage of *long intervals* of meals for such patients, to allow time for perfect solvent operations. With this proviso, I think, your proposition holds good. Hence the first portions passed out of the stomach are the purest chyme the case affords, the most perfectly dissolved, and its exit is *both easier and slower.* So far the dyspeptic makes little complaint, unless he has to reproach himself with excess in quantity, or imprudence as to the quality. But with these early and more favoured portions of the meal, the amount of gastric juice available for the dyspeptic stomach gets exhausted. Hence at a subsequent stage of the gastric solution crude undissolved masses are necessarily presented for passage. These are in themselves sufficient irritants; *but they provoke acid secretions which make them doubly irritants.* Besides, as the process advances, all the stomach movements become more impetuous. The spincter yields in proportion. The evacuation of the stomach is now rapid. *Between the energetic contractions of an irritable muscle, and the morbid mucous lining constantly abraded or made tender by the forced exit of crude, lumpy, or undissolved masses,—no wonder that the last half of the digestive process with dyspeptics is sufficiently painful.* And here the *local* pains are not always the worst. The sympathetic reverberations from this morbid centre to other parts of the nervous system is perhaps the greatest element of misery in the case.

P.—I suppose that the more or less stimulating qualities of the *ingesta* have an influence in determining the kind of intestinal secretions, as well as the degree of muscular contractions?

Dr.—Surely this they do in consequence of their action on the ganglionic and reflex nerves distributed on the gastric surfaces. *Drugs*, even the mildest of them, are irritants of this sort. They

act extremely ungenially and *injuriously* on the *sensitive tissues in question*, of all things else producing the most abnormal efforts of secretion and muscular action. Hence the *fluxes*, and *spasms*, and *intense pain* they often determine.

P.—With regard to digestion in dyspeptics, then, it seems that as the process advances, it is less perfect. The alimentary mass is more lumpy and undissolved; and the difficulty of its exit through the pyloric vent becomes the measure of the greater contractile efforts attempted, and of the greater relaxation of the orifice required. I think that is your doctrine?

Dr.—Exactly. These increased efforts, amounting in many cases to real spasms, this morbid haste to evacuate the stomach, renders the process of digestion imperfect in proportion as it makes it rapid. Hence large eaters have actually what is *called* "rapid digestion," that is, the food rapidly makes its way into the intestines. *But in the same degree it is undigested.* The amount of nutrition it affords is proportionably diminished.

P.—So that is the reason, I presume, why enormous eaters, in general, seldom fatten, as we might otherwise expect. It makes also the case of the moderate eaters clear. If, then, according to this showing, the process of digestion is slower, the food passes less rapidly out of the stomach, it is, therefore, better chymified, nourishes more, and at the same time less fatigues the nervous system (not to say the gastric apparatus); such, at least, is my reasoning from your premises.

Dr.—You are perfectly correct in reasoning and in fact.

P.—How does animal food "keep the stomach" longer than vegetable food? or, how does a meal of vegetable food pass more rapidly off the stomach?

Dr.—I believe the explanation lies in the fact of the one exciting the muscular actions of the stomach more violently than the other. It is well known that vegetables produce a much greater peristaltic action of the bowels than animal substances. Hence they are *relaxant*. The same cause, whatever *that* stimulus to the muscular intestinal coat consists in, determines its more speedy rejection from the stomach.

P.—How do you explain this?

Dr.—I imagine it is because vegetables are less thoroughly acted on in the stomach, that their digestion is completed in the more advanced portions of the alimentary canal, that their masses are therefore more irritant to the stomach walls, and their speedier

exit determined. Hence vegetable food is said "to *sit lighter*," and for the same reason to give less power of endurance of exertion than a mixture of animal food and vegetables. Men of hard work find that *what keeps the stomach* longest is the fittest diet to labour on. Hence bread and cheese is their staple diet, animal food when "they can get it."

P.—This certainly seems to be a wonderful thing, this power of the pylorus to refuse exit, or to allow it with difficulty to undissolved masses of food. I think your idea is justified, that the stomach has an organic *sense*, approaching almost to "reason," altogether to "instinct," in consequence of which it knows when to reject the crude or unfit morsel.

Dr.—Professor Macartney, my once much revered preceptor, used to call it *organic intelligence*. Such an idea is countenanced by some writers. But it is an error. The "sense," or sensibility, in question, is neither "reason" nor "instinct," nor any modification of either. The stomach will pour out its specific secretions, or perform its peculiar contractions, equally on the introduction of a ball of metal or a piece of wood, as of a bolus of food. Where is its "reason" or "instinct" here, if such an attribute were granted to it? *Such morsels are simply rejected because the narrow orifice of the sphincter of the pyloric outlet will not permit it to pass.* This is all. Such masses being long refused a passage, are longer detained in the stomach, and subjected to its revolutions, until sufficiently dissolved to pass into the duodenum. In most cases any impracticable morsels left, such as pieces of gristle or tendon, are eventually discharged from the stomach, with its last emptyings; the contraction of the transverse belt being then strongest, and the dilatation of the pylorus greatest. If this be impossible, then the only alternative left is their rejection by vomiting.

P.—"How charming is divine philosophy!" You certainly have left little of that "knowing" *entity* appointed (by authors) to guard the pyloric passage, and show up in its stead those simple, but unerring *laws of action* governing the parts, that much better answer the same ends, and which at the same time more signally proclaim the hand of the Divine Architect.

Dr.—A proper observation. These movements of the stomach, in fact, are a beautiful illustration of *reflex action*. The alimentary canal is constituted to perform its operations, and to pour forth its secretions, *on the simple contact of any extraneous substance*, be it food or physic, a stone or a bullet. But as nothing

but *food* was *contemplated* being received into the stomach, and as it was made for nothing else, we say that food is the appointed stimulus, &c. On the application of that stimulus, the *afferent nerves report* at the spinal centres what is needed (motor and secretory energy). The *efferent nerves*, on the instant obeying the summons, send forth the power to originate and maintain the requisite actions.

P.—Are these movements in any way under the influence of the animal nerves also?

Dr.—They are. Mental emotion interferes with digestion, &c., by suspending or deranging reflex action, altering the muscular movements of the stomach, and also perverting its *secretory efforts.*

P.—Thereby, I should say, impairing the health and integrity of the whole system.

Dr.—Precisely. A common fit of hysterics, for example, well illustrates the point in question—the influence of the animal on the organic nerves. Here unpleasant mental excitement produces, in the way described, a great and sudden evolution (secretion) of flatus in the bowels, perceived by the rumbling, distension, and other unpleasant symptoms. The indigestion, headache, cold feet, &c., associated symptoms of the attack, prove the *disturbed equilibrium of the circulation*, in which originate the whole morbid phenomena.

In this way, through the same influence, the depressing passions especially, as fear, grief, anxiety, despondency, excesses of every kind, the abuse of purgatives, narcotics, stimulants, &c., tell most upon the stomach; that is, by injuring its exquisite lining, and perverting its natural sensibilities, especially deranging the spinal nerves and visceral ganglionic systems, which are the prime regulators of the great central organ of supply. The sphincters of the rectum and bladder, I may mention, are kept tight by reflex action.

P.—Mental emotion, it is well known, will relax these instantly?

Dr.—Yes; and this by suspending reflex action. *All the involuntary muscles are kept in tone by reflex action*, that is, by the function of the spinal chord. But let mental emotion interfere with this, and the influence of the spinal nervous system is then weakened or withdrawn. In all these cases of emotion, the movements of the heart are simultaneously affected. This alters at

once the circulation in the nervous centres, which most readily perceive and suffer from any loss of equilibrium between the great automatic actions of the machine. Hence the morbid *reaction* at the seats of power becomes more mischievous than the original action or emotion there. It, of course, intensifies the disdisturbance of the spinal nervous system. The heart is rendered irregular, rapid, weak. The muscular tone of the alimentary canal is simultaneously lowered. Digestion is stopped or languishes. The alteration of the secretions is very evident. In some cases immense volumes of gas are instantaneously disengaged, occasionally urine copiously secreted, on occasions of fear or anxiety, or in hysteric paroxysms.

P.—So the whole machine falters in its action, all through derangement of the play of the reflex function?

Dr.—Just so—or if, on the other hand, the emotion be pleasing, its energies are as much exalted. In fact, as before remarked, the influence of the mental states over the organic functions, and of the organic states over the mental functions are reciprocal. The mechanism is one grand whole—one copartnery for good or for evil. Every member (of the firm) sympathises in the weal or woe of another. There is no isolated play of parts. One wondrous bond of sympathy and interest binds them all together.

P.—You before remarked the facility of the stomach's functions, when the mind was at ease. That I have felt. I also know by painful experience the *malaise* and *decouragement* (Anglicé "blue devils") when digestion labours, or when the safety-valves are clogged.

Dr.—The experience of most people will corroborate yours. It is a familiar fact in natural history. Grateful mental stimulus gives firmness and regularity to the actions of the nervous, muscular, and circulating systems. In this way, no doubt, it contributes to digestion, imparting tone and augmenting secretions.

CONVERSATION THIRTY-FIFTH.

The function of the duodenum—Biliary and pancreatic fluids—Precipitants—Chylification—Oils and fats not intended to be digested—The question of fat bacon.

PATIENT.—YOU described the *duodenum*, or first division of the small intestines, as a sort of second stomach. Into this part you said the secretions of the *liver* and *pancreas* were poured, at about four inches from the *pylorus*, as the chymous mass was slowly propelled along in successive waves from the stomach.

DOCTOR.—Yes; in this part of the digestive apparatus new and important chemical changes are effected on the chymous mass, by the admixture of the secretions of the liver and pancreas. This process is ordinarily designated CHYLIFICATION. But we have already alluded to the error of supposing that *chyle*—a *semi-vital* fluid—is formed in the intestines. The real function of the whole alimentary canal is *chymification*, or the simple reduction, solution, and chemical modification, of the nutrient principles. *Chyle* is really a new substance, quite distinct from chyme, elaborated by the lacteals, from the perfectly chymified portions of the food.

P.—Has experiment done as much as in the case of the stomach, to elucidate the operations of this part of the intestinal canal?

DR.—No. These parts being more hidden, less accessible, less easily exposed, are more unfavourable for experiment.

P.—Unfortunately, no such case, perhaps, as that of San Martin has occurred for investigating their functions.

DR.—With regret, I say, no. Yet sufficient is known of them to bring us to a close approximation to the truth. The movements of the *duodenum* are like those of the stomach—slow, progressive, irregular—sometimes in one direction, sometimes in another. Here the alimentary mass changes its properties.

P.—You described the action of the gastric juice out of the stomach—what is the operation of the biliary and pancreatic fluids under similar circumstances? This I presume will throw some light on the function of the duodenum.

DR.—A fair test. They act as *precipitants*. The alimentary mass so treated separates into *three* principal constituents. 1st,

A creamy, oily pellicle, and a turbid, milky fluid, that floats on the top. 2nd, A central portion, a whey-like fluid, containing a solution of saccharine and saline matters, and proteine compounds (albumen, fibrine, &c.). 3rd, A flaky sediment, of insoluble, inconvertible, or undigested matters, with the refuse or excrementitious portion of the bile; that is, its fat, resin, colouring matter, mucus, and salts. These contain a large proportion of carbon and hydrogen, whose elimination from the system is the grand office of the liver, constituting a function auxiliary to that of the lungs and skin.

P.—Does the same precipitation, the same separation of parts take place in the duodenum?

Dr.—It does virtually, although the movements of the part tends to confuse the relative position of the decomposed constituents of the alimentary mass—in other words, to keep them in a state of mechanical admixture till absorption has taken place.

By these secretions, also, important chemical changes are effected. The alkali of the bile and pancreatic juice neutralises the acid chyme, and it acquires, besides the alkaline properties, the colour and bitterness of the bile. The pancreatic juice converts starchy matters into sugar. This in its turn is converted into lactic acid. A portion of the sugar is also converted into oily matter; in which state it is absorbed. Even out of the body portions of animal membrane, kept for some time in contact with water, acquire the property of converting large quantities of sugar into lactic acid.

P.—Is sugar ever found in the blood?

Dr.—No, unless in the state of disease. I was going to remark, that the peculiar principles of the bile, have also the power of precipitating the proteine compounds from their acid solutions. The bile also acts as an alkali on the oily matters and acids contained in the chyme, producing a sort of soapy or milky emulsion, which reduces the size of the oil globules and favours their absorption into the system. It is this oily or fatty matter of the food that gives the creamy colour and consistence to the alimentary mass in the small intestines—qualities which are not essential; for if fat be absent it is more pellucid. It is thick, glutinous, adhesive, to enable the mass to attach itself with more tenacity to the folds of the mucous membrane. As it passes along the bowels, the lacteals absorb *first* the creamy constituents. The venous capillaries absorb *secondly* the whey-like azotised fluid. The

third, or excrementitious portion, descends into the lower bowel, to be cast out of the system.

P.—We hear much of the indigestibility of oily or fatty matters.

Dr.—*Oils and fats are not intended to be digested.* Oil, like water, passes unchanged into the system, is absorbed "neat." As a fundamental constituent of the blood and most of the solids and fluids of the body, oil is as extensively diffused as water, and quite as important in its uses. It is conveyed unmodified into the adipose tissues. It is found in the *trame* or meshes of network constituting the basis of all animal tissues. For its production from alimentary articles, and its introduction into the economy very large provision is made. The utility of fat as an element of respiration has been demonstrated by Liebig. It is not an improbable conjecture, that the foundation element of structure, the primitive form of all living matter, the vital vesicle, or cell, with its nucleus, is a minute oil-globule enveloped in a membrane consisting of a thin layer of albumen, or other proteine substance.

Milk injected into the blood disappears after a time. Its globules become covered with an albuminous layer like a bladder. In this state they are analogous (perhaps identical) with the white globules of the blood. These afterwards evanish.

P.—What becomes of them?

Dr.—Most probably that which becomes of the white globules of the new nutriment poured in through the thoracic duct. After exposure to the vivifying principles of the atmosphere, they are transformed into red globules.

A very remarkable circumstance with regard to the lacteals is, that in a fasting animal they are filled with an alkaline liquid very analogous to lymph. *This alkaline lymph has a great affinity for oily matter.* The milky emulsion produced by an alkali and an oil, takes place in these vessels. After a meal in which fat abounds the lacteals are seen gorged with this rich fluid. When an excess of fatty matters is taken, the irritation it excites, perhaps the impediment to the absorption of azotised principles, induces a flow of bile into the stomach. This is surely followed by headache and heaviness.

P.—Is it not highly probable, then, that the chyliferous vessels are formed chiefly, if not exclusively, with a view to the absorption of fatty matters?

Dr.—It may be so, especially as it is known that the venous capillaries of the intestinal walls absorb the azotised fluids. I

mentioned that foreign substances were met with in the spleen, in the portal veins, and in the liver, when no trace of them appeared in the thoracic duct, or in the general circulation.

P.—*Apropos* of fat, can you explain the digestibility of a bit of fat bacon in the stomach of a dyspeptic—a thing which puzzled Dr. Combe so much?

Dr.—Oil in the stomach increases the acidity of the gastric juice, that is, it increases its intensity, and thereby will proportionably promote the muscular movement of the organ. On this showing, then, a moderate quantity of a fatty substance will facilitate digestion. Even with dyspeptics there is a strong instinct and relish for oily things *up to a certain point.* Indulge sparingly, however, for it is playing with edge tools.

P.—This explanation seems to me to solve the riddle at once. What gases are evolved in the stomach and intestines?

Dr.—Azote, carbonic acid, carburetted hydrogen, and occasionally sulphuretted hydrogen, the most disagreeable. Always remember, that a large quantity of atmospheric air is swallowed with the food.

CONVERSATION THIRTY-SIXTH.

The liver a great purifier and filterer—Connexion of the abdominal veins and lymphatics with the kidneys—The bile, why not secreted only when needed?—Evidence of design—Progress of the chyle—Unconformable elements—Process of fæcation.

Patient.—The liver, you showed, was a great filter, a contrivance to receive and purify the "twice-tainted" blood of the abdominal viscera before it reaches the heart.

Doctor.—Very true; but recollect that the purification of the abdominal venous blood, does not consist exclusively of straining it of matters which are converted into bile, and so thriftily turned to account for the purposes of digestion, before it is finally disposed of. Professor Lippi has demonstrated the connexion of the abdominal veins and lymphatics with the kidneys.

P.—Through such a passage, then, I dare say, foreign, unassi-

milable, or superfluous substances absorbed from the alimentary canal, will be summarily disposed of. And I would add this, as another of the grand *checks*, instituted by nature to prevent noxious dietetic or medicinal matters entering the system.

Dr.—I have no doubt but by that route an excess of azotised and other surplus matters, in the diet, is often got rid of.

P.—What is the consequence of suspended biliary secretion, or what amounts to the same thing, of obstructed gall-ducts?

Dr.—Bile in the intestines is indispensable to the due performance of digestion. Obstruction of the biliary passages disorders the digestive actions, interferes with the peristaltic movements of the bowels, produces insufficient nourishment, and is always attended with clayey evacuations.

P.—Why is not the bile secreted only when needed, as in the case of the other secretions, as the saliva and gastric juice, tears, &c.

Dr.—That the fact is the reverse, only proves that the liver is a great excreting, purifying organ, whose function may not cease for even a short time without compromising the health or life of the animal. But as man's alimentary wants are only occasionally, and at intervals supplied, a reservoir (a gall-bladder) became necessary, wherein to retain the product till it could most profitably be discharged into the alimentary canal, and so serve valuable collateral ends in the economy. The bile is till then wisely reserved. For the same reason it is arranged that the amount of blood in the portal system is greatest at the time precisely when the secretion of bile is most needed. This increased supply is derived from the augmented circulation of the visceral blood, and from the increased quantity of watery fluids absorbed.

P.—The prescience indicated in this ordination of the Creator is as fine as any we have commented on. When I consider how the influx of blood to the digestive organs is liable to be increased by copious eating and drinking, I can well explain the appointment of the diverticulum of the spongy spleen, as you have described it.

Dr.—Truly; it would seem as if the whole and sole purpose of that organ was to stow away the excess of the portal blood, and thus relieve the portal congestion, till the liver is prepared to dispose of it.

P.—I think you explained that the propulsion of the food along the bowels, was a result in consequence of reflex action?

Dr.—Yes; the stimulus of the ingesta, that is, the contact of the mass of the food, and the excitant secretions mingled with it, call into action the muscular coat of the bowels, and propel the mass along. The successive contraction of the fibres from above downwards, determines the propulsion of the fluid mass in a series of wave-like movements. Its course is retarded by the projecting semilunar folds of the mucous membrane. In this course, the fluid nutritious portions of the food are gradually absorbed, and the mass in consequence assumes more and more consistence.

P.—Do you think that the phenomena of endosmose and exosmose operate in the intestinal canal?

Dr.—I have no doubt of it. They explain venous absorption at least.

P.—You have described the course of the *lacteals*, and referred to the vitalising function they perform.

Dr.—Yes; it is here evidently that the processes of animalisation commence, and probably higher depurating changes are effected. Crude or unconformable elements, that had escaped the other guards, are probably strained off into the venous system, and made fit for discharge by the lungs or other outlets. The innumerable intercommunicating points of the lacteals, lymphatics, and veins, afford great facilities for the reception and discharge of such elements as may be unfit to circulate in the vital current. By the time the chyle reaches the thoracic duct its intrinsic vitality is shown in the organised globules which appear. But it is still pale, or slightly pink only in colour. All that it requires is thorough mixing in the heart with the old blood (for nature introduces no vivifying principles concentrated), and the final aërating and electrifying process of the lungs. The chyle enters the left subclavian vein near the heart, mingles with the venous blood, and flows into the right auricle. It thence passes into the right ventricle, whence it is propelled into the lungs, through the pulmonary artery. Here the last touch of vitality is imparted.

P.—Thus the grand nutritive circle is completed, the blood-making process begun in the *mouth* being perfected in the *lungs*. There now remains the last function of the alimentary canal, the process of fæcation, which I beg you will explain to me.

Dr.—Willingly. Its object is to carry out of the body such parts of its *débris* (or used up particles) as are unfit or unable to pass by other outlets; to carry out such, I say, in the shape of

elements separated from the blood in the intestines, in the excretions of its glands and follicles, in the unused residue of the bile, together with the innutritious, unabsorbed, or undigested parts of the food.

P.—*Bene.* Would you specify what are the excrementitious portions of our diet, vegetable and animal?

Dr.—The woody fibres of vegetables and the walls of vegetable cells, whose contents have been extracted. Fragments of tendon, ligament, bone, various inorganic constituents.

P.—What is there in the shape of animal *débris*, or products, of corporeal decomposition?

Dr.—The colouring matter of the bile, epithelium scales, and mucous corpuscles, with various saline particles directly excreted. For example, there is a copious deposit of the earthy phosphates (those of lime and magnesia), because these are insoluble. In the urine, on the other hand, the alkaline phosphates (those of potash and soda), being soluble in water, find their vent.

Alimentary matters becomes acid in the colon, as at the commencement of digestion. The gases also are altered. We find pure hydrogen in the small intestines, and in the larger the more potent carburetted and sulphuretted hydrogen. The feculent character is assumed only when the mass has passed out of the small intestines into the large bowel. Here the secretions of the thickly studded glands are quite *sui generis*, an elimination, as it were, of putrescible matters in the blood, by the only outlet nature could appropriate to the purpose *with comfort and satisfaction to the individual.*

The colon is still abundantly supplied with absorbents. As the alimentary matters advance, their fluid portion is gradually absorbed, so that it becomes more and more solid; when it reaches the *rectum* it is almost dry.

P.—Another of these benevolent and thoughtful contrivances of the Creator, so evident in every department of animal mechanism. How studiously careful in all points, even the minutest, do not these provisions show Him to be for the welfare of the work of his hands! In not one single point could the creature with justice assume the language of the dissatisfied (even if he had the most hypercritical intention to find fault), with having failed to secure completely his interest and happiness. So perfect is the Divine workmanship, so consummate the blended wisdom and beneficence of its arrangements!

Dr.—Truly your reflections would make me say that "an undevout philosopher, as well as astronomer, is mad." Converse with the ennobling works of the Creator never makes infidels, and always purifies the heart as it exalts the intellect. But I was going to finish on the subject of fæcation.

The colon, I must observe, is still abundantly supplied with absorbents. As the alimentary mass advances, its fluid portion is gradually absorbed. It becomes more and more solid, and when it reaches the *rectum* it is almost dry. Here the provision I have alluded to is made for its accumulation, for its retention by the contraction of the sphincter. When this accumulation reaches a certain limit, the specific irritability of the bowel is called forth, and a *reflex action* results, which ends in its expulsion. The will can control this effort, either to avert or to second it. An effort of the will releases the sphincter muscles, and excites the consentaneous descent of the diaphragm and contractions of the abdominal muscles, by whose co-operation the bowel is emptied. So that the first and last acts of the digestive functions—the reception of the food into the economy, and the final expulsion of its non-nutrient portions—are attended with consciousness, and placed under the control of the will. The main and essential parts of alimentation are under the dominion of the organic system, alike removed from consciousness and volition.

P.—Again, on contemplating the least prospective provision for the ease and enjoyment of life, I am forced to exclaim, O that Infinite, who, as he loves to exhibit his power in the order and harmony of the vast, seems to take the same pleasure in bestowing his benevolence on the minute! On how small things depends the endurance, shall I say, the charm of life. For derange this part of our complex machinery, as it appears to be, suspend any of these acts, put any out of place, and what would life be worth? How curiously even, are we cared for in these small things!

Dr.—I respond with all my heart to your feeling appreciation of the wisdom and benevolence shown in the works of the great First Cause, the All-merciful, whose name be praised!

CONVERSATION THIRTY-SEVENTH.

Purification of the blood—The heart a churning or mixing as well as a circulating organ—Recapitulation of the leading facts of the digestive process.

PATIENT.—YOU know that when you have explained a matter to me you always like to strike out its *practical* lessons, whether they be moral or material, in their point of view. The circulation of the blood, by means of arteries and veins, the whole means and apparatus you have now described, of replenishing the exhaustion of the body, of replacing its waste, and of straining off its impurities, it seems to me to excel as a whole, for vital convenience and mechanical contrivance all other simply *organic* apparatus.

DOCTOR.—I quite agree with you, and I will explain the grounds of this belief.

To answer the ends of the animal system, blood must either be renovated in its properties, or thrown out. The latter alternative would not answer in itself, nor if it could, would it comport with that economy of material and of power, which seems the rule of all the Divine contrivance. Blood entirely new made, at each round of the circulation, could only be accomplished at a *ruinous expense* of apparatus, of material, and of labour, and would require, in fact, alimentary supplies quite out of the question, in short, would after all fail of its end, because too stimulating to the animal fabric. Life, indeed, would be speedily extinguished.

P.—How would such perpetually new blood, if it could be made, not answer its purpose, as you affirm ?

DR.—Because it would be too stimulating to the animal structure. It would speedily exhaust and extinguish life altogether. The vital stimuli that sustain all organised fabrics *are afforded in only a largely diluted form.* Even the vitalising air, so momentarily necessary to existence, is *yet largely diluted before coming in contact with the vital structures. Six* parts of foul, or partly used air, remain in the lungs, for *one* part of fresh inhaled at each breath. In the same way, by the same law, the blood is not all appropriated each round of the circulation. The arterial capillaries, indeed, largely abstract its solid materials, and exhaust its vital properties, for the necessary purposes of nutrition, secretion,

exhalation, &c. As the *waste*, then, is limited and gradual, so must the supply be. The other and only mode left to nature, is the economy by which venous blood is restored to its arterial character, its impurities eliminated and its waste replaced. In this way the *old* blood is virtually *renovated* at each round of the circulation, and made fit for all the purposes of vital replenishment and structural rebuilding.

And so, it is clear, answers all the ends of blood, that could be each time made anew; that which has been *spent*, drained, and impoverished—which is unfitted to supply the waste of the system, and is loaded with the *débris*, and effete matters of the system, received at all points of the returning circuit—this blood, so spent, so loaded, so impure, comes to the grand central organs to receive the tribute of the new blood, which requires there to be intimately mixed with the old, and thence both to be exposed to the vivifying influences of the atmosphere in the lungs.

P.—You make it out, then, that the heart is as much placed by the Creator where it is, for the purpose of *churning up and intimately mixing* the old blood with the new, as for propelling the said fluid through the pulmonary or systemic circulation.

Dr.—I fully believe that the force-pump action of the heart is only part of its function—that for the other part of its work it must be considered a grand organ of admixture. It is quite an untenable, an unlikely hypothesis, that the thick walls of the *right* side of the heart are for the mere purpose of propelling the blood through the small circuit of the lungs. At this rate the walls of the *left* side should be five or six times thicker than they are, as having five or six times the amount and distance of hydraulic apparatus to move. But so far as the propulsion of the blood *by the heart* through the lungs is concerned, it would be easy to show, on principles already explained, that the actions taking place between the air and the capillaries of the lungs, would of themselves insure, at least, the free course of the blood into the lungs. This last act is, perhaps, the most important of life's processes. Without it, the vital actions would instantly languish, the circulation would come to a stand in a very few minutes—animal sensibility, consciousness, and voluntary power would be abolished; and shortly even the functions of organic or vegetative life would cease. The want of food produces the same effects, much more slowly indeed, but not less inevitably. Under such circumstances, the waste of the economy is drawn from its own tissues—a store that may last

for days, weeks, or months, according to the kind, condition, and health of the animal.

P.—Hence you make clear the necessity for constant renovation of venous blood, by constant supplies of food from within, and of air and electricity from without?

Dr.—It is just so.

P.—Will you now recapitulate and write down for me, the leading facts of the digestive process, so that I may have concentred in a focus, as it were, and embodied for future reference, the substance of our more discursive conversations?

Dr.—With all my heart; and I will make them as short as possible. But excuse a few repetitions. They will all the more enforce important points.

The alimentary canal, as it has been shown, in its true types, is a simple inversion of the exterior surface of the body. The lining of such passages must necessarily inclose all the vital viscera. Matters in this canal, therefore, are virtually *exterior* to the true vital seats and boundaries—to the great organising, transmuting, or assimilating apparatus—as much so as if they were laid simply in contact with the skin; as much so, in fact, as a train in a tunnel is, to all intents and purposes, *exterior* to the strata of rocks, the beds of earth, the veins of ore, and the organic remains through which that tunnel may be bored. Food in such a cavity, it is then clear, has not yet come within the sphere of the vitalising apparatus and operations. The change effected in this part of the economy is merely *preparatory*—simply *chemical*, not *vital*. Analogy, *à prori* arguments, and actual experiments on artificial digestion, all prove this. The change effected is no other, neither more nor less, than a simple solution, and new combinations, of the nutrient principles of the food.

Digestion can only be called a *vital* process in so far as its chief agents, the salivary, gastric, biliary, and pancreatic secretions, are products of the *living* tissues; and, inasmuch as the muscular movements and animal temperature that thereto contribute, are the result of vital properties and operations.

The gastric juice acts on alimentary matters in a manner entirely and exactly conformable to the laws of chemical solution—that is, *to the extent to which it can saturate*. This saturation is

aided by minute division of the matters to be dissolved; by thorough contact of the solvent fluid with its particles; and by elevation of temperature;—all which conditions are wonderfully secured by the apparatus nature has provided in her living laboratory.

The solution of alimentary matters in gastric juice out of the stomach is as perfect as the natural digestion, *only it requires a longer time.* This is not surprising, when the disadvantages of the artificial experiment are considered—that is, the difficulty of combining several conditions that influence the chemical action of food in the living stomach. As the absence of the peculiar motions of the stomach, the failure of constant fresh additions of the solvent, and the want of the removal of the dissolved portions. In the natural process, the external layer of chyme is removed as fast as it is formed, which prepares the way for the action on the layer beneath. These drawbacks in the artificial process must, of course, materially interfere with both its speed and perfection. But when allowance is made for these defects, the results are identical.

Digestion, then, properly and philosophically viewed, *is a purely physical function.* Its object is merely to modify the physical condition of the alimentary matters; to reduce, dissolve, and dilute them, to fit them for fresh chemical arrangements of their elements, and for ultimate absorption into the living system, so that by the real vitalising and organising processes there taking place, it may become *assimilated*, make one with the living solids and fluids, and part and parcel of animal structure. *Digestion*, in this view of it, is then a beautiful and beneficent provision of animal existence to meet the requirements of the great law of general physiology, formerly laid down, viz., *that no nutritious matters can nourish or be absorbed unless previously reduced to a fluid state.*

There is a perfect analogy between the absorption and elaboration of the sap of plants, and those of the nutrient juices of animals. As the sap *ascends from the roots*, it is a crude fluid at first, but gradually acquires sweetness, acidity, lime, potass, sugar, mucus, albumen, an azotised substance like gluten. *But it is only after they have been subjected to the vivifying oxygen and electricity of the atmosphere, by means of the stomata (pores) of the leaf (lungs), that the nutrient fluids receive the crowning act of elaboration, the true vitalising influence, and become fit for*

the deposition of the characteristic products of the vegetable kingdom. These facts significantly point out to us, if we rightly read the analogy, what is the real function of the alimentary canal of animals, and what are the vital processes that subsequently take place in the absorbent and aërating apparatus.

The alimentary matters contained in the stomach and intestines are tantamount to the nutrient soil of plants, and hold precisely the same relations to the absorbents of the animal, as the fluids of the soil to the roots of the plant. The true idea and office of an alimentary canal, then, is that of a cavity to contain this soil, wherein to dissolve, dilute, and modify the alimentary matters; to strain off their impurities, to separate the excrementitious from the nutritious portions; a receptacle, in short, in which the nutrient elements may be prepared easily to pass into the vital system, so as by the subsequent organising processes then undergone, it may be fitted for incorporation with the living structure. Into this soil, the roots (the absorbents) of the animal strike. Hence, in the course of its passage into the system are elaborated by the secretory apparatus, the materials that go to build up structure, to replenish exhaustion, to repair waste. In this way, the plant immovably fixed to the soil, and the animal moving about from place to place, have their suckers continually in contact with their nutrient juices. (Thus beneficent, I repeat, are the provisions—thus comprehensive is the care of a supreme superintending Providence for the welfare of all that his hands have formed.)

With the same provident care and beneficence, has the Creator constituted a fixed relation between the nutrient principles contained in the food, and those of the solids and fluids of animals. Their chemical elements and their proximate principles, are identically the same. As all the varieties of corporeal structure reduce themselves to a few primary forms, or elements of matter, so all the varieties of food, vegetable and animal, how heterogeneous soever their constituents, their consistency and their conformation, are reducible on ultimate analysis into the same *organic* principles. These are albumen, fibrine, caseine, &c., with the inorganic substances, soda, potass, lime, magnesia, sulphur, iron, phosphorus, &c., and they are all found precisely in the same relative proportions, the latter ingredients to the former, as they occur in animal structures. The transmutation of these materials

into the blood and tissues of the animal, constitutes the function of *nutrition or assimilation.*

The special provisions of the animal economy, whereby the dead crude alimentary matters are gradually approximated to the nature, and finally converted into the substances of the living fabric, are as follows:—

1st. *The solvent process*—digestion proper, or the mechanical and chemical function of the alimentary canal, the preparation of the materials for the ulterior stages of blood-making and structure-building. In short, the exclusive end, the real function of digestion is *decomposition*, not in the sense of destruction, but the separation of the dietetic articles from their combinations into their elementary principles.

2nd. *The filtering process* of the bowels, liver, kidneys, &c.

3rd. *The mixing process* of the old and new blood in the powerful *churn of the heart.* This, of itself, is a step higher in the vitalising of the aliment.

4th. The entire animalisation of the nutrient principles is effected in the lungs by contact with the vivifying oxygen and electricity of the atmosphere. Up to this point the new blood can scarcely be said to be "alive," and the venous blood is, for all active purposes in the economy "dead," at least *wasted, spent,* and *mortally poisoned.* This concluding process, therefore, is the perfecting act of the vitalising series, the crown and completion of the whole.

5th. The act of *nutrition* or *assimilation*, in its largest sense, consists in the amalgamation of the materials so formed with the living structure, and the separation or deposition from the blood of those elementary constituents of each tissue which their growth or decay may require. By a peculiar vital endowment of each, by a primary law of its constitution, each appropriates from the common pabulum or store-house (the blood) those ingredients, and those only, which its composition requires. In consequence of this vital affinity of each tissue for its own constituents, and for none other, it is brought about that the same nutrient source is made to yield with undeviating accuracy, and just at the time needed, and in the measure needed—here brain, there bone; here marrow, there muscle; here membrane, there mucus; here hair, there horn; here nerve, there nail; here tear, there tendon. *This is the wondrous self-reparative power of living organisms,* and

the secret and the source of their continued existence, during a definite period, in the midst of disintegrating agencies, so powerful and so incessant in operation, that were these counteracting processes suspended but for a few hours, the death of the structure would be inevitable. Thus, by a mechanism the simplest in its parts, yet the most consummate in contrivance, the development of animal structures is provided for, their waste renewed, their exhaustion replenished, the relaxed spring of vital properties or functional powers wound up, and all *ab intra*, all silently, unconsciously, involuntarily, a daily, hourly, momentary process, till "the silver cord of life is loosened," and "the golden bowl broken at the fountain."

PART IV.

THE

SCIENTIFIC PRINCIPLES OF DIET AND REGIMEN:

EMBRACING THE

APPLICATIONS OF MODERN PHYSIOLOGY AND ANIMAL CHEMISTRY

TO

HUMAN NUTRITION.

CONVERSATION THIRTY-EIGHTH.

The chemical elements of alimentary substances the same as those entering into the structures of the body—Carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, iron, chlorine, soda, lime, magnesia, potash—The (simple) chemical elements of food—Alimentary principles—Compound dietetic substances.

Doctor.—In this new department of our discussions, I am about to unfold to you the nature and effects of those modifying influences of the external world, that are continually operating upon the living organism, and calling forth its reactionary powers for good or for evil, according as they are well or ill regulated, and according as they are normal or abnormal, in the kind and degree of the organic stimulus they afford. On this is founded the science of Hygiene, that whose object is to teach us how to regulate this corporeal reaction by laying down fixed principles or certain rules for the employment of each "modificateur." For the present we shall chiefly confine our conversation to the materials of corporeal reparation, and the various questions arising out of that comprehensive and fertile field of inquiry. And to begin at the begining here, as it is proper to do in all scientific expositions, I shall systematically treat of, in the first place, of the *chemical elements* of foods; in the next place we shall discuss the *alimen-*

tary principles, and conclude this preparatory part of our exposition with a statement of the most salient facts connected with *compound aliments*, or those substances in nature derived from the animal and vegetable kingdoms, which minister to the sustenance of man.

PATIENT.—Has the living body the power of forming its own elements, or constructing its tissues, its component parts, by the conversion of one elementary substance into another?

DR.—A very pertinent question. I reply unequivocally, that it has not this power. No transmutation of elements is possible by animal organisms. The elements of which the body of an animal is composed must be derived, *ab externo;* they exist in the elements of its foods, wrapped up (if you like the phrase) in the alimentary principles.

P.—Well; will you enumerate the chemical elements of dietetic substances?

DR.—They are our old familiar friends, carbon, hydrogen, oxygen, nitrogen, phosphorus, sulphur, iron, chlorine, soda, lime, magnesia, potass.

P.—The *diamond* is, I believe, an instance of pure carbon?

DR.—Yes; in its crystallised state it might be called transparent charcoal. It is an essential constituent of every organised structure, animal or vegetable, and therefore is a universal ingredient in food, remarkably provided by nature for nascent organisms, in seeds, yoke of eggs, and milk.

P.—What is the average quantity of carbon daily taken into the system, in the shape of food?

DR.—Liebig estimates it at a trifle above fifteen ounces, nearly one pound daily, for a robust, active, well-fed adult. Ten ounces, I should think, nearer the mark.

P.—How is this quantity of carbon consumed?

DR.—It is thrown out of the system by the lungs and the skin, in the form of carbonic acid. In other words, it is *oxidised.* This union of oxygen and carbon evolves heat, wherever effected. These chemical changes are the sources of animal temperature, as I before explained.

P.—But supposing that carbon is deficient in the food, or that food altogether is withheld, how is the animal heat maintained?

DR.—Not well of course. In that case, the fat of the body is consumed for fuel. The heat of the body and blood is uniform in all climates, 96°. But in cold climates, this is only maintained,

of course, at a great expenditure of combustible matter. Hence the keener appetite and the grosser fare under these circumstances, that is, food replete with carbon and hydrogen, oils and fats, which contains from 66 to 80 per cent. of carbon. Twenty pounds of whale's blubber per day is not too great a consumption for an Esquimaux.

P.—Something of the gormandising power of these and other savages must be attributed, however, to their natural brutality, to a morbid organ of alimentativeness, eating being one of those pleasures left to the man in common with the beast, and which must become proportionably developed as their degradation deadens all their noble faculties, and bars the inlets of higher enjoyments.

Dr.—I have before adverted to the frequency of diseases of the liver in Europeans, in hot climates, and its cause, excess of carbon in the system, from the inappropriate diet, a diet fitted to support the natural heat of the body in a cold climate. This error of quality is aggravated by excess in quantity and deficiency of exercise.

P.—Oxygen, I know, is largely received into the system, and is the great vital stimulant, and the chief agent of all the changes that occur in natural bodies. How large an ingredient does it form of our food?

Dr.—Its relative proportions and those of all the rest of the elements of food in the alimentary *principles* I shall afterwards show, in a tabular form, when we come to discuss this branch of our subject.

Hydrogen forms a large element in alimentary principles. In many it is united with oxygen in the same proportions as in water. Thus sugar, starch, gum, &c., are hydrates of carbon. In others it is united with oxygen in a greater ratio than is necessary to form water, as in citric and tartaric acids (dry). In a third class of alimentary principles, the hydrogen is in excess beyond the proportions in which it exists with oxygen in water. Of these the proteine compounds, fat, alcohol, &c., are instances. The oxidation of hydrogen, or its conversion into water, is one subsidiary source of animal heat.

P.—Nitrogen, or azote, is, I believe, the alimentary element *par excellence.*

Dr.—Yes; it is an essential constituent of animal fabrics, and consequently of those nutrient materials nature has provided for

their development and nutrition, as in the albumen of the yolk of egg, and the caseine of milk. In short, whatever exacts the process of digestion, in order to its conversion into materials of assimilation, that is, into the respective *tissues* or kind of structure; whatever is so changed by the operations of the digestive apparatus is an azotised ingredient. Whatever is not so changed, whatever the gastric and other digestive juices (salivary and pancreatic) fail to act on otherwise than by way of forming an emulsion, as fatty and oily substances; whatever is absorbed *neat*, as water—these constituents of food are non-nitrogenous. They are let in among the organic apparatus, they everywhere pervade it, even an infinitessimal fat globule is supposed to constitute the nucleus of the primitive cell-organism; but neither oil nor water are strictly capable of organization—although constituting necessary materials and conditions of organic operations, and even contributing to the formation of adipose or fatty tissue. A large number of animal and vegetable substances used as food, contain no nitrogen. These constitute the *materials of respiration, the fuel for keeping up animal* heat, for feeding the living furnace. In contradistinction to these, Liebig calls the *azotised* substances, the *sanguigenous* or *plastic* elements, those exclusively ministering to *nutrition*. With what limitations Liebig's doctrine is true, that nitrogenised foods alone nourish the tissues, I shall afterwards inquire.

P.—So, I was going to make a suggestion; for many facts regarding the use of oily starchy foods, by natives of hot climates, who undergo great fatigue, and whose bodies must be proportionably wasted and renovated, as for example, Hindoo runners and palanquin bearers — strike me as hardly reconcilable with the doctrine you announce.

Dr.—A very apposite and grave objection. I shall take up the subject a little farther on in our discussions. In the mean time, for the exposition I am anxious to give of the whole philosophy of nutrition and diet, we must proceed upon clear ground, and bit by bit lay down the first principles of the science, *so as to be able to reason thereon truthfully and cogently, and to remove the host of errors, inconsistencies, and contradictions with which the whole subject is beset, both in medical books and in popular practice.*

P.—That will be doing a great service. For if any question more concerns human comfort than another—if any study or

science more contributes thereto than another—it is *that* which aims to enlighten man as to those dietetic and other observances that are most in harmony with the laws of his physical organisation, and therefore the best fitted to ensure that corporeal health, mental vigour, and prolonged span of existence, necessary to accomplish the *high* ends of human existence. I must confess that all the guides and manuals on these subjects I have hitherto looked into, and I have perused most of them with the avidity of a dyspeptic, although conveying much useful information, have yet abounded chiefly in didactic precepts, or in the results of individual experience. The latter is confessedly extremely imperfect, is beset with fallacies, and moreover, and what is worse, is frequently made the basis of the former. Because COUNT CORNARO attained above a hundred years on fourteen ounces of solid food and fourteen ounces of fluid per diem, does it follow that the same *modicum* will ensure the same results in every diversity of constitution, age, condition, climate, and labour? I believe not. If you can establish *fixed and comprehensive principles* from the more accurate data of modern chemical and physiological science, then we shall have sure guides of dietetic conduct. The whole question then will be *to vary the application of fixed principles to individual cases.* This, in all deranged constitutions, and by every man who values health, will still remain as before the province of the medical practitioner, and the more confidence will be placed in his dicta, in proportion as he shall be known to found his prescriptions on the dictates of accurate science, and not altogether on the authority of fallacious experience. Mr. Smith advises me to be a *vegetarian*, because the system agreed with him. But with all due deference to my friend, I do not quite think that his habits, constitution, temperament, and tendencies, in many respects the opposite of my own, a fair criterion by which to judge of the diet that is most conformable to the wants of my case and condition.

DR.—There is much truth in your observations. Dietetic observances must be placed on a surer basis than heretofore. I believe it is in the power of modern medical science (although much room for discovery still remains), to come infinitely nearer than ever before to the sound dietetic guidance of man, both in the states of health and of disease. To this study I have given considerable devotion for years—indeed, during a long period, when the digestive organs were extremely sensitive to the influ-

ence of dietetic observances, and since. Before we finish these conversations, let me hope to be able to satisfy you that my labours have not been fruitless, nor my time misspent. I believe if you act upon the precepts I am prepared to give you—precepts deduced from general facts and principles, and modified in their applications by my knowledge of how the functions of your body work, and how they have been affected by former maladies—if you allow these to be your rule of action in the scope of the matters they embrace, you will have to thank me and your good fortune, under Providence, for a plenitude of health and of earthly enjoyment you, as an old dyspeptic, had only thought realizable in the fables of Arcadia or Utopia.

P.—Well, I who have seen for myself and criticised your doings, do not think that you exaggerate. But all this is a digression from your main subject. You were proceeding in your exposition of the chemical elements of food, as being identical with those of the body.

Dr.—These, I was showing, were identical with the constituents of the body. Sulphur is another of these. All the proteine compounds contain it. It is sulphur which discolours the silver spoon in eating eggs. The evolution of sulphuretted hydrogen by decomposing organic substances proves its presence. The urine eliminates sulphates from the system. There is an alkaline sulphocyanide in the saliva. Hence the gold plates supporting artificial teeth become incrusted with a coating of metallic sulphuret. Sulphur is in the cereal grains, in peas, beans, almonds, nuts, turnips, cabbage, potatoes, mustard, &c.

Phosphorus enters into animal tissues, and is an essential constituent of blood, flesh (albumen and fibrine), and bones. In all these it is combined with oxygen and lime. It is found in eggs and milk. It is a constituent of the brain and nervous matter, and of the sexual apparatus and fluids. Phosphorus abounds in fishes. Ammoniacal phosphate of magnesia is contained in the bran of flour. Raw sugar contains an earthy phosphate.

P.—Iron seems to me a curious ingredient of organised beings.

Dr.—It is an essential constituent of our food. It is contained in small quantity in the ashes of both animals and vegetables, in yoke of eggs, in milk, and the blood corpuscles. The proper colour of the blood depends upon it. Traces of it are found in most vegetable foods.

Chlorine is found in the blood and in some of the excretions,

in combination with sodium (common salt) ; in the gastric juice it is combined with hydrogen, forming hydrochloric acid. In these shapes there is great consumption of chlorine. To meet the demand thus set up, perhaps, the instinct for salt in most animals exists. Salt contains sixty per cent. of chlorine. Of the alkaline and earthy constituents of animals and of foods, soda and potass, magnesia and lime, I need make no remarks. Subphosphate of lime is the chief basis of the bones. The same exists in muscle, nervous matter, the liver, &c.

A table of the relative quantities (per cent.) of the elementary constituents of various articles of food, &c., will be found in the Appendix.

CONVERSATION THIRTY-NINTH.

Alimentary principles—Two grand divisions, azotised and non-azotised; or nutritive and respiratory elements.

PATIENT.—How do you define an alimentary principle ?

DOCTOR.—It is the union of a given number of the chemical elements I have already told you of, and which forms a dietetic compound. Thus sugar and fat are composed of three elements each. Water is composed of two : fibrine and albumen, of six elements each.

These alimentary principles have been variously arranged by medical writers. Dr. Prout, taking milk as nature's model food, as containing water, sugar, butter, and caseine (an albuminous substance), classed alimentary principles into four great groups, —the *aqueous*, the *saccharine*, the *oleaginous*, and the *albuminous*. But such arrangements are open to great objections. In the first place, they are inexact and unscientific. To arrange foods according to any predominant element in their composition, is to overlook, or to exclude from view, other elements of proportionate importance. Bread is something more than starchy food, meat something more than albuminous food, and nuts something more than oleaginous food. In the next place, they are of little utility in a practical work. Liebig's simple division of food into *azotised*

and *non-azotised*, or those furnishing respectively the materials of nutrition and of respiration, will answer every practical and scientific end.

P.—I hear much of proteine and proteine compounds. What are they?

Dr.—Proteine is the common nutrient substance, or plastic element, constituting the common basis of fibrine, albumen, and caseine.

P.—Will you enumerate what are reckoned alimentary principles?

Dr.—First, then, the *azotised*, or what Liebig calls the sanguigenous or plastic elements of nutrition. 1. Fibrine. 2 Albumen. 3. Caseine. These are identically the same, whether derived from the vegetable or animal kingdoms. 4. Gluten of wheat. 5. Gelatine. The three former of these are otherwise called *proteine compounds*, because one chemical principle is the basis of them. This was named *proteine* by its discoverer, Mulder. Any of these, dissolved in caustic potash, and then treated with acetic acid, precipitates proteine. These proteine compounds contain, besides small quantities of sulphur, phosphorus and salts.

The *non-azotized* or respiratory principles are: 1. Starch. 2. Sugar. 3. Oil and fatty matters. 4. Gum. 5. Pectine, or vegetable jelly. 6. Acids. 7. Salts. Among the doubtful alimentary principles I place, 8. Woody matter. It belongs to this non-azotised list, rather as excrementitious than as respiratory material. 9. Alcohol.

P.—The identity of animal and vegetable fibrine, albumen, and caseine seems to me very wonderful.

Dr.—This is one of the facts we owe to the school of Liebig. Clearly the animal derives it from the vegetable. The animal does not *create* it, but *converts* it into its own organism. I shall exhibit to you these three grand nutrient principles as derived respectively from the animal and the vegetable kingdoms. They are simply modifications of each other.

Fibrine. 1. *Animal.* This is the basis of muscular fibre—the lean of meat—flesh. Divest the clot of blood of its colouring matter, and you have pure fibrine. Alone it is incapable of supporting life. 2. *Vegetable.* Fibrine most abounds in the cereal grains, wheat, rye, barley, oats, maize, rice, and in the juice of grapes. It exists in carrots, turnips, and beet-root.

Albumen. 1. Animal, instanced in the white of egg and serum

of blood. It exists solid in flesh. It is the chief constituent of the blood corpuscles. Albumen, although the basis of all animal tissues, will not alone nourish. Animals will die rather than take it beyond a few days.

Vegetable albumen is an ingredient of the farinaceous seeds. It abounds in oily seeds, as almonds, nuts, and in most vegetable juices. Vegetable albumen differs from vegetable fibrine in being soluble in water. Gastric juice coagulates liquid albumen, and then dissolves the coagula.

CASEINE. 1. Animal. This is the curd of milk. You might call it the cheesy principle. It is highly nutritious. It is the basis of the tissues of the young mammal. It contains, in the most soluble form, a much larger proportion of the earth of bones than blood. 2. *Vegetable* caseine has been named *legumine*, as chiefly found in leguminous seeds, as peas, beans, lentils. It exists with albumen in oily nuts. It is soluble in water.

P.—Will you explain to me the nature of GLUTEN?

DR.—By washing the *dough* of wheat with a stream of water, you remove the vegetable albumen, sugar, starch, and gum—the sticky grey mass left is gluten. This is a highly nutritious substance, and alone, of immediate organic principles, suffices for the perfect nutrition of animals. To this principle is owing the highly nutritious power of wheat flour. The predominance of this viscid principle in the wheats of the South and of Egypt, renders them peculiarly fitted for the manufacture of *macaroni* and other pastes. To the same is owing the lightness of wheaten bread, whose tenacious dough is puffed up into vesicles by the carbonic acid in the process of *panary fermentation*. The digestibility of bread depends much on the lightness or *sponginess* thus imparted—the gastric juice more readily entering and acting on substances of loosened texture.

P.—Do you call GELATINE an elementary principle?

DR.—I am afraid a very slight one, although it contains nitrogen. It differs essentially in its chemical properties and composition from the proteine principles. The latter are identical with the flesh and blood of animals. Not so the gelatinous tissues. Their nutritive qualities differ as widely. The former become hard by boiling; the latter yields a jelly, which forms with water a tremulous mass—*gelatine*. *Collin* and *chondrine* are modifications of gelatine. *Glue*, *size*, and isinglass jelly are examples of the former. Skins, tendons, gristle, cellular tissue, serous membranes,

and isinglass, are the sources of gelatine. For its ultimate composition, see Appendix. These qualities, you will perceive, are closely allied to those characterising the proteine compounds, but there is one essential point of difference, and to which I attribute the worthlessness of gelatine as a nutritive substance, that is, the absence of sulphur, phosphorus, and the salts; without the *inorganic* constituents of animals, and the materials contained in their ashes, no substance is really and permanently nutrient. In discussing the question of *soups*, I shall afterwards recur to this subject.

P.—Well; you have exhausted the list of the azotised alimentary principles, will you give me a similar *aperçu* of the nature of the non-azotised?

Dr.—Of these we named starch, or the *farinaceous* principle as holding the first rank. Sometimes it is called *fecula;* otherwise *amylum*. It exists very generally in plants, being found in seeds, fruits, roots, stems, tubercles, &c., &c., and is organised, consisting of small grains of various shapes. These grains are laminated, forming a series of concentric layers. Starch is a hydrate of carbon. To be rendered digestible the grains must be burst by cooking. Starch is a mild, easily digestible food. It is an essential article of food; to me it seems as a *diluent* or reducer of the more concentrated forms of nourishment. Thus there is an *instinct* to consume it in connexion with animal food, or with oily matters. In the process of digestion it is transformed into gum and sugar. Liebig holds that it is incapable of conversion into organised structure. It is a simple element of respiration. This opinion requires some qualifying. We shall afterwards discuss this subject. Sago, arrowroot, tapioca, cassava, tous-les-mois, are varieties of starch.

P.—Sugar is, I suppose, as extensively diffused in vegetables as starch?

Dr.—Yes; but not so abundantly. It holds a subordinate place in the constituents of plants proportioned to its small amount in the sum total of other alimentary principles that constitute our daily nourishment. Sugar, like starch, is a *hydrate* of *carbon*. In its due proportion it is a most wholesome article of diet.

P.—So that its prohibition to children, who have a natural instinct for it, is more a motive of economy than a dictate of science?

Dr.—Quite so. It is an article readily digested. I suppose the assertion of its injuring the teeth was the *ruse* of some econo-

mical housewife, thrown out *in terrorem*. The slaves fatten on it in the sugar season.

P.—But you will admit its too free use may be injurious in dyspepsia?

Dr.—Of course, the *abuse* of any alimentary article will injure even the sound. In such case, it may form lactic acid in the stomach, or even oxalic acid, leading in time, under favouring circumstances to an oxalate of lime calculus.

P.—I shall be particularly interested in what you have to say of fat and oils, employed as foods.

Dr.—Perhaps oleaginous dishes have for you a peculiar piquancy? They therefore excite your interest.

P.—I know that when I am hungry, that the sight or bare idea of them excites my *alimentativeness*.

Dr.—Well, to the healthy man, whether it be instinct, or sophisticated appetite, the dishes in question are always savoury, and in moderation wholesome, if the *air* and *exercise* are such as to render them expedient. To thousands farinaceous matters are absolutely uneatable, unless with the seasoning of oil. I fully admit, however, that oils and fats are difficult of digestion, in the *popular* sense. Strictly oil, no more than water, is digested, or requires to be digested. Like water, oily matters, when sufficiently reduced and saponified by the pancreatic juice especially, are absorbent. As fat or oil is never organised, it needs no digestion. Its presence is necessary everywhere in the economy. Its use and its diffusion is co-extensive with water; and, like water, it enters into the system unchanged. After it has performed its part the carbon from that source alone forms a very valuable respiratory material. Hence, when it is received in superfluity above the present demands of the body, it is stored up (in the cells of the areolar tissue) as a reserve and resource when carbon is deficient in the food. The refractoriness of an excess of fat in the stomach is such as always to bring a flow of bile into that organ. This fact Dr. Beaumont substantiates in the case of San Martin. Hence the headachiness, or the positive bilious attacks supervening on the undue use of fat food. *I* attributed "the superior digestibility" of a bit of fat bacon (if such be the fact), which so much puzzled Dr. Combe and others, to the superior digestive efforts, both in the way of secretory and muscular action of the stomach, called forth by the presence of an amount of fat just refractory enough

for that end, out not so refractory as to bring in a flux of bile. The process of *curing* does, however, alter the nature of fats, rendering them easier of transit then fresh fats. No man, I contend, can have headache, or an approach to it, without at least a small portion of bile in the stomach. This phenomenon is very apt to take place under mental emotion, from the sympathy of the digestive apparatus with the brain. Ninety-nine headaches in a hundred, I believe, are of this nature and origin. These evils are increased by the acrid and irritating fatty acids, the indigestions from these matters evolve in the stomach. The neutralisation, or rather the absorption of the oil in starchy matters, such as potatoes or bread, is what alone renders the stomach at all tolerant of them in crowds of cases. Of course the more rancid oily matters are previously, the more likely are they to become noxious in the stomach. The reason why foods fried in fat or oil usually prove so refractory to weak stomachs, is that the high temperature alters the chemical constitution of the oils, developing acrid volatile acids. The very names of some of these, *hircic* and *caproic acids*, are enough. The wise dyspeptic will always avoid fat, under whatever disguises of cookery, whether in the shape of herrings, hashes, salmon or suet-dumplings, sprats or stews, melted butter or marrow-puddings, chocolate, cocoa-milk, or cod-oil.

P.—But are not fats said to be nutritious?

Dr.—They are commonly regarded as such—if the deposition of fat in the system, and not the development of flesh, be the criterion of nourishment. The former object, however, is often a correct one, if there be a great deficiency or undue consumption of the fatty particles of the body, as in tubercular diseases. It then becomes in fact, an important indication of treatment, and a valuable agent of cure. I need not here advert to Liebig's doctrine, that oils are incapable of transformation into organised textures—that they merely serve for respiration. The diet of the frozen regions well countenances this opinion.

P.—Is fat found in the blood, which I think it must be, from your statement of its going unchanged into the system?

Dr.—It does not exist certainly in the free state, yet we see globules of oil floating in the chyle of the lacteals. The nervous and adipose tissues receive their supplies of fat from the blood, and it must exist there—how combined is the point to be ascertained. Physiology or animal chemistry gives us nothing very

precise on the subject, save the detection in the blood of *cholesterine*, *oleic*, and *margaric acids*, *seroline*, and *cerebrote* (cerebric acid)—all fatty substances.

P.—Well; what have you to say of the gummy principle of food?

Dr.—As a nutritive principle, not much. Like sugar and starch gum is a hydrate of carbon. It exists almost universally in plants. In some it exudes spontaneously, concreting on the stem its "tears." Its greatest use is as a demulcent in irritations of the mucous membranes.

Analogous in dietetic power is pectine or vegetable jelly. It is contained in most pulpy fruits, in currants, cherries, and berries of all sorts, plums, apples, pears, quinces, apricots, melons, oranges, lemons, tamarinds, &c.—and in greater abundance the riper the fruit is. Pectic acid is identical with pectine. Sugar promotes the solidification of both—a property the confectioner takes advantage of. Pectine is also a hydrate of carbon, with a surplus of oxygen.

Acids require a word of comment; vegetable acid has been from time immemorial an ingredient in human diet, in the shape of vinegar, which is obtained from the acetous fermentation of wine. The acid contained in fruits and succulent herbs, is absolutely necessary for the preservation of health. The deprivation of these in long sea voyages was the cause of scurvy. Vinegar, however, let me guard you here, is no preservative against scurvy, and is very mischievous when habitually taken—if in excess, ruining the digestive apparatus. It is an approved receipt whereby to produce tuberculosis or consumption.

P.—In what sense is salt an alimentary principle?

Dr.—The saline components of our food are all essential to health and even life itself. Deprive beef or bread of their saline or inorganic constituents, and they would fail to support life. Common salt and earthy phosphates, salts of iron and of potash, are as indispensable ingredients in our daily diet as fibrine or albumen. Salt is more than a seasoning. The appetite for it is more than a habit—an instinct. Salt has undoubtedly much to do in keeping up the due constitution of the blood. From the salt of the blood the gastric juice derives its hydrochloric acid, and the bile its soda. Earthy phosphates are necessary in the food as the inorganic constituent of the bones. The excess of these matters above the wants of the economy is eliminated in the secretions.

P.—Woody fibre you reckoned among the questionable alimentary principles.

Dr.—It is a *negative* one at least—if there can be such a thing. There are certain *wood-breads*. The Laplanders use bark-bröd. It probably owes its nutritive power to starch contained in it. The woody fibre of our ordinary vegetables is indigestible in itself; but no doubt a cause or aid of digestion to the matters with which they are associated. They keep up a salutary stimulation of the alimentary tubes, and by their bulk contribute to the due distension of their coats, which is one condition of their efficient muscular action, probably also of their secretions. Thus the external covering of the farinaceous seeds, particularly the bran of wheat, the skin, husks, and stones of fruits, the green matter of the leaves of plants, although all unassimilable matter, are valuable for excremental purposes. These present no small resource in cases of otherwise intractable dyspepsia. But the taste of mankind dictates in a reverse direction. Art is compelled to separate what nature has joined. And the *usual* consequences of consulting caprice or fashion rather than reason, are apparent in the stomachal discomforts all but universal in society.

P.—What opinion do you hold of alcohol as an alimentary principle?

Dr.—Nil. We reject it entirely as such; I shall, however, take another occasion of discussing the effects of spirituous potations. I have detained you long enough to-day; but we have cleared our path of a great deal of preliminary matter. If we have done nothing else we have defined our terms, and laid a foundation for our future reasoning.

CONVERSATION FORTIETH.

Alimentary substances proper, or the solid and liquid foods of man—1st vegetable products—The cereal grains.

PATIENT.—I AM very desirous of hearing your views as to the dietetic character of man, whether he be a *carnivorous* or a *frugiverous* animal; or, as I suspect, the truth always lies between extremes, whether he be not *omnivorous*, as many able writers justly (it seems to me) regard him.

DOCTOR.—The inquiry is of great interest, and of infinite practical importance; I know few more so. But great difficulties and fallacies beset it on all sides. The question has occupied my best attention for a long time, and I have done all I could to arrive at the truth on the subject, setting aside all prejudice and preconceived views, allowing neither the dictates of appetite, nor the influence of fashion to bias a decision where the voice of reason should alone be heard. In fact, the conclusions I have arrived at, are at variance with the views of many excellent men, who, I believe, I can clearly show, to be blindly zealous in the propagation of *error*. But the time is not yet come for this part of our exposition. Proceeding in the natural order of things, it is necessary that I give previously a brief summary of the principal facts touching the nature and properties of the principal alimentary substances, whether derived from the animal or the vegetable kingdoms. We shall first take up *vegetable productions* as the source whence the materials of all animal organisms are primarily derived.

Here our arrangement will be quite arbitrary. Botanical or scientific arrangement otherwise is not expected of us, indeed, is not necessary. Yet not discarding it entirely, I shall group the dietetic articles we shall briefly discuss, rather in the order of their nutrient value than any other. The division, then, I propose of alimentary substances taken from the vegetable kingdom is as follows:—

First class. The *cereal grains*, or *farinaceæ* (that is, whatever we make meal of), viz., 1, wheat; 2, oats; 3, barley; 4, rye; 5, rice; 6, Indian corn; 7, mullet; 8, peas; 9, beans; 10, lentils; 11, nuts.

Second class. ROOTS and TUBERS, STEMS, BUDS and LEAVES. 1, potatoes; 2, carrots; 3, parsnips; 4, turnips; 5, onions; 6, asparagus; 7, cabbage and greens; 8, cauliflower; 9, spinach; 10, mustard and cress.

Third class. FRUITS proper. 1, apples; 2, pears; 3, gooseberries; 4, strawberries; 5, raspberries; 6, plums; 7, cherries; 8, peaches; 9, oranges and lemons; 10, grapes; 11, currants; 12, figs.

P.—Well, a goodly list, and of articles of the highest interest and importance in themselves, from the part they are called to play in our household economy. I am sure I shall listen with all attention while you expound to me whatever facts science has established regarding the composition, properties, preparations, and uses of these varied articles of human nutrition.

DR.—By understanding well the nature of dietetic substances, you will be prepared for the subsequent discussions that will be built thereon. To begin then with those first in the scale of dietetic value—the cereal grains. Of these wheat is the chief of meal stuffs, that which yields us what we are taught to pray for as the type and symbol of all human nutrient substances.

Wheat is composed of *starch*, *albumen*, *fibrine*, *gluten*, *oily matter*, *sugar*, *gum*, *earthy phosphates*, *woody matter* (or bran, husks, &c.), and *water*. Refer to the first table for the ultimate composition of corn (wheat, rye, oats). You will perceive that they are *perfect foods* as containing due proportions of the elements employed in making blood, and those for keeping up animal heat. Adequately cooked, they are nutritive, and readily digestible. By referring to Dr. Beaumont's table, the mean time of chymification of this sort of food will be shown. Wheat contains a greater quantity of gluten than the other cereal grains, and therefore its nutritive value is higher in proportion. *Semolina* and *soujee* are granular preparations of wheat divested of bran. Macaroni and vermicelli are tenacious pastes of the same, which owe their pipe-form to its being forced through holes in a metallic plate. These properly cooked are light, nutritive articles of food. They much enhance the nutritive power of soups. The "*farinaceous foods*," as *hards* sold for children, profess to be formed of the finest wheats only, modified by some heating process. Denshaw's contains one pint of barley-meal to three of wheat flour.

P.—After all, BREAD is the staple from wheat, and, perhaps, the most important article of human food. Will you give me your

disquisition thereon? Bread-making, I believe, to be one of those arts that *yet* remain to be perfected. Enlightened and advanced as we profess to be in this the middle of the nineteenth century, the bread that the million eat, and these not the poor alone, is a mere apology for bread. It is a delicate thing to tax whole classes with fraud; but it is quite clear that there is an immense sophistication of bread-stuffs, at whose door soever it may lie. We hope reform will enter and clear away these and other abuses, by-and-bye.

Dr.—Well, I hope to make these conversations useful, not only by expounding matters of science, but occasionally by throwing out hints and suggesting facts that may tend to improve the practice of those arts that minister to our corporeal comforts. For the errors or insufficiency of these arts constitute one very palpable inlet of ill-health to many who suffer—little knowing or suspecting the real source of their aliments.

P.—What change takes place in the ingredients of flour by the process of *pannification*, or in the fermentation, that is necessary to make loaf bread?

Dr.—*Yeast*, or leaven, with salt and water are added to the flour. The dough is raised, or made light and porous, by the vinous fermentation which then takes place, favoured by the action of gentle heat. The two principle constituents of flour are *gluten* and *starch*. The gluten, you will recollect, is identical in composition with the albumen of vegetable juices, and with the albumen of the blood. The *bran* is peculiarly rich in this principle. The gluten is the eminently fermentescible principle, and it is that which imparts to the paste or dough its elasticity, stiffness, stickiness, cohesion, and workability (if I may coin a word). By the action of the *gluten* in the *starch*, with the concurrence of heat and water, a portion of it is converted into *sugar*. The same chemical changes take place as in the commencement of the germination of the seeds, after steeping barley, in the making of malt, only in *baking* a small per centage of the starch, in malting, the greater part of it, is converted into sugar by the action of the adjacent particles of gluten. *It is the sugar*, AND NOT THE GLUTEN of *which a part enters into fermentation, and is decomposed into alcohol and carbonic acid.*

P.—In the making of bread, therefore, I am to understand you as saying there *is no loss of gluten?*

Dr.—Yes; that is a great point to know; and only a small

portion of the starch of the flour is employed in the production of sugar. The leaven acts on this sugar, as well as that which is naturally contained in the grain. The expansion of the fluids evolved, alcohol, acetic acid, carbonic acid, and hydrogen, which are prevented escaping by the tenacity of the gluten, is that which imparts the vesicular or spongy character to bread; so that in well-baked bread there is not a grain of starch but what has burst its envelope. When the bread is *heavy* there has been insufficiency in the gluten or failure in the fermentation.

P.—The relative proportion of gluten, then, contained in the several parts of *farinaceæ* is that which will determine their rank as foods, their grade in the dietetic scale?

Dr.—Unquestionably. The amount of bread which one obtains from a given weight of flour depends on the quantity and quality of the gluten. Wheat and rye are the grains richest in gluten, and are, therefore, the most extensively used in the making of bread.

P.—The baking of bread, that is, of perfect bread, I suspect, is not so easy a process as it seems?

Dr.—Believe me, nothing is rarer, anywhere, than to meet with *good* bread, the genuine unsophisticated article as it was intended we should eat it; that is, in accord with its own laws, and those of the organism it was intended to sustain. I now bake my own bread, to the great satisfaction of my own and my friends digestive organs.

There are a great many practical minutiæ in the manufacture of bread, and in the details of its processes; attention to which is necessary to attain the perfection of the article.

In the first place, *the whole grain should be used* to obtain its full nutrient power, and to secure the conditions best fitted for its digestion.

The wheat should be sterling in quality, plump, full grown, ripe, free of smut, rust, chaff, cockles, and tares; well cleansed in short, of all impurities before milling, and not ground too fine, and set to cool before bagged, and always kept in a dry, clean, sweet, perfectly ventilated room.

The *yeast* should be unobjectionable. As the rapidity of fermentation is according to the temperature, that in which the dough is to stand before it is baked is a matter of some nicety to regulate, as well as the length of time during which it ought to stand; for if the vinous fermentation be not checked in due time by baking,

the dough becomes sour. This acidity may be neutralised by pearlash or soda, but the quality of the bread is irreparably injured, and its nutritive value lowered.

As to the subject of kneading there is some difference of opinion among the initiated in those mysteries. Sufficient must be used, at least, to incorporate thoroughly the ingredients of the mass. More than this, I should say, cometh to evil. I believe, for my part, the less kneading, after a due amount, the *lighter* the bread.

The regulation of the OVEN is, perhaps, the test of the perfect *artiste* in this line. Here the greatest care and judgment are required. If the oven be too hot, the bread will be burnt outside and raw within; if too cold, it will be sodden and heavy. Here all the watchful attention of a good baker is called for.

Lastly. The bread being withdrawn at the proper time, should lie exposed to the action of the pure air for twenty-four hours, to part with the noxious gases evolved, to absorb oxygen, to mature for its most wholesome use. Perfect bread-making, I call and consider, as the *ne plus ultra* of cooking.

P.—From all this I planly perceive how few are those who enjoy what should be the commonest blessing, thorough *genuine* bread.

DR.—This will be still more apparent if you advert to the voluntary sophistications of the grain that ignorance and fashion combine to sanction, the accidental damages accruing to the grain, and the frauds that are practised to cover them in the manufacture of bread.

1. *Bran*, the outer husk, would seem to be a mischievous, at all events, an inert and useless principle in grain, so anxious are people to get rid of it, and so strong is the popular prejudice against brown bread, or bread made of the whole meal. But what are the facts of the case? Boussingault had reckoned the *lignine* or *woody fibre* in wheat to be $7\frac{1}{2}$ per cent. M. Millon's analysis, however, makes it only $2\frac{38}{100}$ per cent. for soft wheat, and $1\frac{25}{100}$ for hard wheat. A mixture of brans of various wheats gave $7\frac{1}{2}$ to 10 per cent. of woody matter. The following is the analysis of bran:—

Starch, dextrine, sugar	51·	nearly.
Gluten	14·9	
Fatty matter	3·6	
Woody fibre	9·7	
Salts	15·7	
Water	13·9	

P.—That analysis shows very clearly how essentially nutritive bran is.

Dr.—Independent of this, and more than this, its woody matter is a better provocative of those muscular and secretory actions of the stomach and bowels than all the stomachic cordials, dinner pills, and peristaltic persuaders that ever issued from the Apothecaries' Hall. In this point of view, men deprive themselves of a natural digestive stimulant of priceless value; no where else to be found than in following nature's ordinances.

P.—But would you not propose grinding the husk finer, in order to its more general adoption as a constituent?

Dr.—That is the great desideratum wanted, and the great difficulty in the use of the article hitherto. Now, in advising the husk to be eaten with the grain, I advise the former to undergo the same comminuting process as the latter; let both be used *reduced to powder*. But there is one thing of infinite value in meat and drinks which the analysis does not show. There is an aromatic principle in the bran, the absence of which in dietetic articles nothing can compensate. It is this which gives its *savour* to bread, its *bouquet* to wine; it is what *ozmazome* is in meat, the gustatory quality *par excellence*. Now, in eliminating the bran from the wheat you not only deprive the staff of life of its finest solid principles, its natural condiment, you rob it, moreover, of fifteen, twenty, or twenty-five per cent. of its alimentary principles; impoverishing it in its azote, its starch, its fatty matters, and its salts. Can any conduct be more insane? What is there to compensate this loss? How dear we pay for our refinements? all this to obtain *whiteness of loaf!*—an ideal quality purely valueless This is a grand error on the score of political economy, a waste of a nation's food. But the evil does not end here. This is, perhaps, a negative loss to the rich, who can compensate it by the highly nitrogenised and savoury viands their tables groan under. But to the poor, and to children, whose subsistence bread literally is, the injury is positive and incalculable. But there is a *positive* evil to all consumers of this white deteriorated bread, especially as made by public bakers. Alum is in almost universal use, both to improve the whiteness, elasticity, dryness, and firmness of bread made from inferior kinds of flour, or a mixture of flour and potatoes, and to permit the dough to retain a much larger proportion of water, and thus to augment the weight of the *batch*, or the quantity of bread yielded. Bread is about one-

quarter heavier than the flour used in its fabrication. This is owing to the combination of the elements of water with the flour.

P.—While talking of inferior flour, allow me to ask what is the nature of *musty* flour, or what causes flour to become *musty?*

Dr.—Millers are in the habit of slightly moistening the grain before grinding, the more readily to effect the separation of the flour from the husks. The flour should then be very carefully dried by artificial heat to remove this moisture. Instead of this, it is often immediately put in sacks or barrels; the flour then is sure to spoil, sooner or later. It cakes together in lumps, and feels harsh, like gypsum. It is musty in flavour. These changes are the result of acetic and lactic acids formed in the flour by the action of the gluten on the starch, favoured by the moisture. The gluten, thus spoiled, is soluble in water, which it is not naturally. Now it is precisely in the *drugging* of this deteriorated flour, to render the gluten again insoluble that the *poisoning* of bread takes place. *Sulphate of copper* (a poison) is the favourite remedy to make from this damaged flour bread as beautiful and seducing in its external qualities as that made from the best flour. *Alum* answers the same end, and being the *slowest poison*, it is considered more *humane* to use it, and it is, therefore, in most extensive use; it is, in fact, a regular branch of trade to supply bakers therewith.

P.—I do not wonder that even in healthy stomachs this bread is refractory; but I can easily conceive that in dyspeptic stomachs it must create the greatest disturbance.

Dr.—The law has foreseen this evil, and denounced it, and prohibited it even by penalties; but what is law on the one hand pitted against cupidity? and how light is health on the one hand when weighed in the balance with fashion!

P.—What is your objection to mixing potatoes with flour?

Dr.—This simply; if people will eat potatoes with their bread, let them do so; but to add potatoe-starch to flour is palming off upon us an inferior article under colour of a superior; is—

P.—Cheatry. But what do you say to patent bread? *to raising the dough without fermentation?*

Dr.—In *principle* it *seems* sound enough; rendering the dough porous without fermentation, by means of substances which when brought into contact, yield carbonic acid—as hydrochloric acid acted on by (sesqui) carbonate of soda. But it is a perfect illusion to imagine anything is gained thereby. The flour, as I have

already shown, does not suffer in its nutritive value or digestibility by a small portion of its glutten passing into the soluble state. In this state it is identical with albumen. Moreover, *ninety-nine times in a hundred,* this mode of baking is an abomination; many of my friends have been all but poisoned by it, and I have known many cases of severe stomach disorder that could only be traced to this kind of bread, drugged with soda and acid. I have seen ailing persons *kept ill by it,* who soon recovered on giving it up. For practically, besides other grave objections, it is the most difficult thing possible to make really light bread in this way.

P.—I quite understand. You impressed upon me the fact that it was the sugar, and not the gluten, at the expense of which the fermentation took place, and the products, alcohol and carbonic acid, were evolved.

Dr.—The nutritive value of malt is not inferior to that of the barley whence it is derived, although its gluten has undergone a much more extensive alteration than the gluten of dough. So the plastic constituents of potatoes are hardly affected by distillation. Nothing then, I say, is gained by the new process. The old plan has every recommendation of simplicity, efficacy, and cheapness, as a means of rendering bread light and porous. But what is this muriatic acid that is to supersede it as part agency? In commerce it is the rarest thing possible to find it *uncombined with arsenic!*

P.—You astonish me. This is even worse than the sulphate of copper business! Well, before quitting this subject I should like to hear your opinion of all the varieties of the bread genus—on biscuits, cakes, rusks, rolls, &c.

Dr.—Biscuits, sea biscuits, are dense compact bread, fit only to be penetrated by the gastric juice of sailors. For the dyspeptic its cohesiveness requires to be overcome by grinding, or soaking in hot water. Of rusks, tops, and bottoms, and light sweet biscuits of various sorts, it can only be said that they are the least noxious, perhaps, of pastries; being mixtures of butter, sugar, milk, flour, yeast, and sometimes, compounds, always to be eschewed by the dyspeptic stomach; plum cake I cannot name without horror, or visions of suffering innocents, a hodge-podge of eggs, sugar, lard or butter, raisins, currants, and almonds—the article is only fit for the voracious maw of the hog. All medical men unite to put this in their *index expurgatorius,* however they may differ on other items of the dietetic *carte.*

P.—In conclusion, let me ask your opinion of the nutritive power of BREAD?

DR.—This question is not to be settled by any individual's experience, but by experiments on a large scale. A man with a very *capacious stomach*, living much in the open air, and taking abundance of exercise, could sustain himself, I have no doubt, perfectly, on *whole wheaten bread*, but only in these conditions. I have known a man do so, but his allowance was 3lbs. *per diem*, a quantity no man in civic life is disposed to eat or able to digest. Bread is the staff of life only metaphorically, or as a poetical symbol, for it is fit to be eaten with all foods, liquid and solid, and to form the basis of all meals. A modern *utilitarian* philosopher, versant in animal chemistry, and averse to all that is not conveyed in point blank language, would pray, "Give us our daily bread and beef," and the well-to-do working man would add, perhaps, "fruit pudding;" and all, probably, would vote for the addition of vegetables. Bread alone (for the million) will not sustain prolonged or perfect nutrition. The effects of a diet of bread and water in prisons, are scarcely a fair criterion of what bread *could do*. How feebly it sustains, compared with a composite diet of animal and vegetable substances, is a fact too notorious for comment.

P.—Enough now for one conversation. Although rather tedious, I am glad to know all you have told me. When I write home to my friends, they shall not have reason to say that I have idled my time at the water-cure. Its practices have made me all but well. Its theory and its rules will, I have no doubt, keep me so.

CONVERSATION FORTY-FIRST.

Alimentary substances proper—First group.—Farinaceæ continued. Oats, barley, rye, rice, Indian corn, peas, beans, lentils, nuts. Second group.—FRUITS—*apples, pears, strawberries, raspberries, gooseberries of various kinds, grapes, plums, cherries, peaches, oranges, lemons, figs, currants. Third group.*—Roots *and* tubers, *stems, buds and leaves; potatoes, turnips, carrots, parsnips, onions, asparagus, cabbage, greens, cauliflower, spinach, mustard and cress.*

PATIENT.—FOLLOWING your dietetic exposition, will you give

me some account of the grain you reckon next in nutrient power to wheat?

Doctor.—Oats and rye contend for this place, the former especially are quite equal in alimentary value. Their analysis by Boussingault shows a very slight difference in ultimate composition.

	WHEAT.	RYE.	OATS.
Carbon . .	46·1	46·2	50·7
Hydrogen .	5·8	5·6	6·4
Oxygen . .	43·4	44·2	36·7
Nitrogen .	2·3	1·7	2·2
Ashes . .	2·4	2·3	4·0
	100·0	100·0	100·0

Here the nitrogen yielded by oats is very nearly equal to that of wheat. Fifty years ago oatmeal constituted the almost exclusive food of the peasantry of Scotland; so also of the most stalwart men of England—the Lancashire peasantry. Oats stripped of their husks are called *groats* or grits—"Emden" groats when *crushed*—"prepared" groats when ground. Oatmeal is made from the seeds kiln dried and divested of their husks and outer skin before grinding. Refer to the composition of oatmeal in the table.

P.—The common objections to oatmeal is that it produces heartburn or acidity, and is therefore unfit for dyspeptics, and that it disposes to skin diseases.

Dr.—The former objection is too well-founded, the latter not so. It is strong diet, that is, the unfermented oat bread, only fit for very strong men, taking very strong exercise. In the form of stiff, thick porridge, in small quantity, with tea, I find it answers for some who toil with the head more than the body; and eat otherwise very sparingly. But cases differ. One admitted virtue of this diet in those with whom it agrees, is that it infallibly keeps the bowels open.

P.—What is your opinion of gruel?

Dr.—Very high, especially in chronic diseases, and in the con-

valescence from acute diseases. It retains all the nutritive without the irritating properties of the grain; and on account of the nitrogen and salts, or ashes it contains, is infinitely to be preferred to the starchy preparations, sago, arrow-root, tapioca, &c. Butter should never be added to it. Thick, well-boiled oatmeal porridge is the very best possible breakfast for robust labourers.

P.—RYE is but little employed as food in England. I find its composition in your tables. Will you proceed with the subject of BARLEY, and its preparations, which are matters of greater dietetic interest?

DR.—The grains stripped of their husk by a mill, constitute Scotch or *pot barley*. The rounded and polished seeds, free of all integuments, compose *pearl barley;* the latter ground, forms *patent barley*. This grain stands next in nutritive value to rye. It is laxative, and its bread difficult of digestion. MALT is barley which has been made to germinate by moisture and heat, and afterwards dried. During the development of the germ the starch contained in the barley is converted into sugar, by the action of the adjacent particles of gluten.

RICE is too well-known to need but a slight remark. It is not a substantial nourishment, and none of the farinaceæ are so by themselves. Their great value is an accompaniment to other food —as diluents (so to speak) or qualifiers of the highly nitrogenised. But to talk of them *replacing* that other food, is to put them out of their *place*.

P.—Will you come now to the LEGUMINOUS SEEDS—peas, beans, and lentils? these are of more interest *to us* than Indian corn or millet, which please pass over.

DR.—Although highly charged with nitrogenous principles (as will be seen by a reference to Table No. 2), so as to be twice richer in nutrient materials than wheat, yet on account of the deficiency of phosphate of lime (the prime constituent of the bones) in peas and beans, their real dietetic value is very much impaired. Of these grains, the lentil (*ervum lens*) is the most agreeable to the taste, and the most easy to digest. They constitute the famous REVALENTA powder of Dubarry and others, sold at 3*s*. per pound!

P.—Nuts and oily seeds, as almonds, &c., are rich in nutrient elements, I believe?

DR.—Yes; as containing vegetable albumen and caseine; but

they abound also in fixed oil, which renders them difficult of digestion. Every person careful of their health will avoid them, either as dessert or in puddings, cakes, &c. Almonds unblanched are particularly obnoxious. Bitter almonds yields by distillation *prussic acid.* Moderate quantities of them are often highly pernicious, large doses of them fatal. The remarkable symptom of this sort of poisoning is swelling of the face and head, with an eruption of nettle-rash, together with vomiting, sometimes stupor and convulsions. The *oil* or *essence of bitter almonds is* a virulent poison, being in general four times stronger than the medicinal prussic acid. A single drop of it will kill a dog in a few minutes. Yet such is the substance extensively used by cooks and confectioners to flavour pastry.

P.—I think you have now exhausted your first group of vegetable alimentary substances—the *farinaceæ.*

Dr.—The second group, although inferior in dietetic value to the first group, yet unquestionably next to them in importance, and quite as interesting in their way. At the top of this group of esculent vegetables stands the POTATOE. As a part of richer diets, it is nutritious and easily digestible. This root consists microscopically of a mass of cells filled with an albuminous liquor and some dozen starch grains in each. Boiling cogulates the albumen, which forms irregular fibres between the starch grains, which absorb the watery parts of the albuminous liquor, swell up and distend the cells in which they are contained. The cells then separate from each other. When these changes are complete, the potatoes are *mealy;* when they are only partial, they are *waxy.* (See Tables, end of Vol. 1.) The chemical composition of the potatoe you will see at a glance by referring to Table No. 2. The amount of nitrogen in potatoes is very small, and this even decreases as the potatoe is kept. From the small quantity of nitrogen it contains the nutritive power of the potatoe theoretically is very low. This is proved, besides, by a number of facts. I admit that under certain kinds of easy labour, and if a *sufficient quantity* can be taken to make up for *quality,* then the potatoe is adequate to sustain health and moderate strength. But to do this from three to four times more of potatoes than of ordinary mixed aliments must be received into the stomach. Now this daily distension of the paunch would little suit those eagerly exercising either brain or limbs, or both, in the bustling pursuits of business, the im-

mobile quietude of study, or the exciting strife of politics. One pound of butcher's meat is equal in nutritive value to ten and a half pounds of potatoes. For the alimentary principles in the potatoe refer to Table No. 2.

The amount of starch in potatoes varies with the season. When the vegetation of the plant is most active, it is least, because the buds grow at the expense of the starch. Hence in spring potatoes are less mealy. Hard and waxy potatoes are less digestible than the mealy. Potatoe starch is sold as *English arrowroot.* It is highly soluble; its nutritive value is very slight indeed. It must be decidedly valuable, however, as a basis and diluent for rich sauces, and dishes of condensed animal principles. It is much mixed up with the common cocoa powders. The potatoe contains free citric acid. On this depends its unquestionable antiscorbutic virtues. In the Millbank Penitentiary, scurvy used to prevail among the military prisoners, whilst it was never seen among the convicts. This exemption was attributable to the diet of the latter containing five pounds of potatoes weekly. On the addition of potatoes to the rations of the soldiers, the disease no longer presented itself. At sea its efficacy has been proved in the same manner. It is not necessary to eat them raw sliced with vinegar, as Sir Gilbert Blane mentions, nor *baked,* which diminishes their nutritive power.

The sprouts of potatoes which shoot towards the light when kept in cellars, contain a poisonous vegetable alkali, *solanine*—this cannot be detected in any part of the potatoe as grown in the field.

P.—After potatoes, I suppose, you will summarily dismiss turnips, carrots, and parsnips?

Dr.—They do not require much comment. They contain a very small amount of nitrogenous or really nutrient matter; but when properly cooked, they are excellent *adjuvants* and diluters to animal food. One of the essential conditions of good digestion is a certain distension of the stomach, in order duly to call forth the powers of its muscular coat. To eat highly nitrogenised and as it were *condensed* food to this extent would be injurious, and is in fact, repugnant to our instincts. But a due intermixture of this more voluminous material, while it is highly agreeable to taste, conduces at once to an easier digestion, and a more wholesome assimilation—not to speak of its decided advantage for excrementitious purposes, in cases of constipation. Their juices

evidently contain some salts, or some fixed or volatile oils, which have a marked influence in maintaining the healthy proportions of the blood's constituents. Their flatulent effects are merely in the uninitiated, or from being eaten in excess relatively to the solider constituents of the meal.

Onions, with leek, garlic, &c., are rather condiments than foods. Their pungent qualities depends upon a peculiar essential oil, which is dissipated by boiling. They are then easily digestible; raw they are not so. *Asparagus* is as wholesome as it is agreeable. It has a slightly diuretic action.

P.—I suppose you would assign a pre-eminent rank to cabbage, greens, cauliflowers, spinach, as *fillers-up* of the stomach in banquets of more substantial fare?

Dr.—There is nothing more wholesome, eaten in moderation, and well-cooked. All these vegetables lose by drying some 90 per cent. of water. What remains is peculiarly rich in nitrogen and sulphur. According to Boussingault, 83 parts of dried cabbage are equal in nutritive value to 100 parts of wheat. For the digestibility of some of these articles, refer to Table No. 3, constructed from Dr. Beaumont's experiments. I shall afterwards point out a grave error, occurring in many of these experiments. Most of the less nutritious articles remain but a short time in the stomach; but their earlier disappearance is no proof that they have been digested. The contrary is oftener the fact. *Sourcrout* is chopped cabbage allowed to ferment, and highly salted. During my long sojourn at Graëfenberg, I ate it freely, and digested it easily, but this was after above six month's water-cure treatment, when recovering from all but incurable dyspepsia. It is not a dish for delicate stomachs; stewed with pork and other fat meats it makes a capital and not unscientific mess, but one only fit for the *dura ilia messorum*. Rhubarb is a salutary substitute for apples and gooseberries, in tarts and puddings, at the season when the old stock of the former is exhausted, and the new supplies of the latter have not yet come in. On account of the oxalic acid it contains, rhubarb is objectionable food in the oxalate of lime diathesis, especially if the water which the patient drinks is hard. Rhubarb is apt to gripe and prove aperient; this effect will often be prevented by the addition of a little ginger.

Lettuce leaves, young, make a bland salad; the older leaves contain a bitter, milky, soporific juice. Hence they are counselled for supper to those who are troubled with sleeplessness — and

generally proves very stupid and unphysiological advice. This juice inspissated is extensively used medicinally as the mildest of opiates. Mustard and cress make good additions to lettuce salads, with vinegar, oil, salt, &c.

P.—Your *third* group of vegetable aliments, viz., FRUITS, somehow or other, have a very piquant interest attached to them. If you would allow me to apply an architectural metaphor to your classes of foods, as expressive of their relative importance and uses, I should call the 1st (*cerealia*), the base; 2nd (*roots and tubers*), the column; and 3rd group (*fruits*), as the *Corinthian capital* of the vegetable dietetic pillar.

DR.—Yes; there is a certain elegance associated in our mind with fruits, that merits for them the *high* place you assign them in your artistic figure, which is, perhaps, not very *mal-apropos*.

Apples and pears, the first I place in this list, I believe to be readily digestible if of good quality, thoroughly ripe, *eaten on an empty stomach*, masticated thoroughly, taken *by way of refreshment, and not as a bellyful*. A *gorge* of these, I admit, is highly indigestible. Persons with delicate stomachs are often found with a great desire to eat fruit. My advice is to chew the apple well and throw out the pulp, and then it will be found the most refreshing and innocent of fruits for the dyspeptic.

Dr. Beaumont's experiments confirm my view of the matter. Roasted or stewed apples are easier of digestion than the raw. They are an excellent article of diet for the constipated, if they agree otherwise.

P.—What are the dietetic qualities of the berried fruits?

DR.—Gooseberries, strawberries, raspberries, black and red currants, in their season and duly ripe, are both food and physic. When solider meats pall or disgust, they constitute delicious repasts in themselves, or additions to repasts which otherwise would be tame and insipid. He whose digestive powers are unsophisticated, will not readily forego the luxury of these fruits. The husks and seeds are indigestible. But this is not an objection to their being swallowed in many, if not in most cases, especially if the object be to obviate constipation. The *jellies* and *preserves* of these fruits are anything but digestible, and require to be used in great moderation; their best use is as a mere *whetter* and *relish* to solid farinaceous puddings. For their composition I refer you again to Table No. 2.

P.—The grape, I suppose, you would call the king of *fruits*, as the potato is of *roots*, and wheat of *farinaceæ*? I hardly expect you to give me an account of the varieties of grapes, and the equally varied wines they produce.

Dr.—Although I have seen nearly every kind of grape grow, and could tell you of such abominations in wine-making as would make your eyes start from their sockets, such details are not my object in the dietetic review I have undertaken to give you. It would require many volumes to discuss *seriatim* the details of each article. All I can undertake is to give you some salient facts connected with each, which it is proper for you to carry in your memory, in order sometimes to profit by them in practice. For the composition of grape-juice see Table No. 2.

Fresh grapes are highly nutritious and digestible articles of diet. If used exclusively for food, or nearly so, I question the propriety of rejecting the husks and seeds. These constitute the *bulky elements* the stomach requires in order to perfect digestion. For delicate stomachs and susceptible bowels, by all means deprive these and other fruits of their indigestible parts. In febrile and inflammatory complaints, they are occasionally the only food that can or ought to be eaten. On the continent the "*cure de raisins*" does wonders every year in inflammatory dyspepsia and in consumptive disorders. Dried grapes (raisins) are a perfect food in themselves, but are to be sparingly used.

The bitartrate of potash is a prominent ingredient in grape-juice. It is this, with the colouring matter, which forms *the crust of wine*. This salt suffers partial decomposition in its passage through the system. Its base is passed off by the urine; its acid is replaced by carbonic acid. This change must have taken place at the expense of a considerable part of the oxygen inhaled, which would otherwise have united with the constituents of the blood.

P.—Some stone fruits are great delicacies; but I have been always afraid of indulging too freely in them from the greater danger attributed to an excess in them. This may be mere popular prejudice.

Dr.—To swallow their large stones is not intended, as their accumulation is always a serious matter, producing often fatal intestinal obstructions and inflammation. The excess in the use of their pulp would produce the ordinary effect of an over dose of fruit, viz., stomach derangement, gripes, and diarrhœa. Prunes

(the dried plum) I consider indigestible. Peaches and nectarines, from their high price, are almost as great rarities to the masses as *olives* and *dates*. See their composition.

I have exacted too much of you in this long conversation. It is time now to conclude. Your sketch of vegetable alimentary substances has not been without its uses. Oranges and lemons are near the bottom of your vegetarian list. They have the renown of being the antiscorbutics *par excellence*. Has science or experiment affixed its seal to this popular opinion?

Dr.—Far from it. Lemon juice is not an infallible specific. I believe that of the fresh fruit would be so; but with the crystallised citric acid it is very different. The disease has often raged on board ships *despite its use*. Plenty of fresh *animal* food, in conjunction with vegetables, is the best antiscorbutic.

P.—What do you say of lemonade?

Dr.—In many cases it is unobjectionable—iced in hot weather, or for allaying thirst in fevers.

Melons and mulberries, figs and pine-apples, I dismiss with a simple reference to their constituents, as shown in Table No. 2. Cucumbers and pickles are pernicious. When stewed, they are light and wholesome.

CONVERSATION FORTY-SECOND.

Products of the animal kingdom used as food.

Doctor.—We have first discussed vegetable alimentary substances, for the sole reason that they have a priority in production. The constituents of animal foods are elaborated, in the first instance, by vegetable; the fibrine, albumen, caseine, fat, salts, &c., that constitute the dietetic value of flesh meats, being the mere transference to animal textures of materials which it is the sole and exclusive function of plants to create. It was therefore necessary for me to show these substances, as existing in some of their original sources, at least most of those used directly as food by man. The animals on whom man feeds are mostly the *herbivora*.

The pasturage of these animals is their "bread," and is replete with all the constituents of their tissues.

P.—Why then should not man go directly to the same sources as the animals for the materials of his structure, that is, the immediate products of the soil, since you say they are got from the animal only at second-hand.

Dr.—This seems plausible at first view; but it will not bear examination. If man were organised like the brute beasts he might live as they do. If he had the many stomachs of the sheep or the cow, and led its quiet, mechanical, monotonous life, it would suit him to stuff himself with their *voluminous* food. But this is not the case. This, however, is prematurely entering on a question which only falls in place further on. In the meantime, we proceed with the discussion of animal foods. Here we shall follow a similar division to that used in the case of vegetable foods—grouping them in the order of their dietetic importance and use. 1st group—the Mammalia: their flesh and appurtenances—red flesh (fibrine); white flesh (cellular tissue, ligaments, tendons). 2nd group—Birds. 3rd group—Reptiles, fishes, shell-fish. 4th group—Milk.

P.—Of course, in your remarks, I shall expect you to include only such animals as we ourselves, in this country, most commonly use for food.

Dr.—Any notice of the others would be irrelevant to our objects. Besides, in this conversation, I do not intend to make any comments on individual animals which furnish our food; but simply to develope the nature of those various parts of the animal that we turn to account dietetically, as the muscles or flesh, blood, fat, cellular tissue, tendons, bones, cartilage, viscera, and milk.

P.—I suppose you will say that beef and mutton, pork and venison, with the flesh of the hare and rabbit, is the almost extent to which we furnish our tables from the class—"Mammalia."

Dr.—I think that nearly completes the list. First, then, talk we of the composition, properties, and physiological actions of the muscular part of these animals, or *flesh* proper. This is, however, always more or less mixed with cellular tissue, tendons, fasciæ (the investing membranes of muscles), fat, blood, nerves, and vessels. The chemical constituents of flesh are water, fibrine, albumen, gelatine, hematosine, ozmazome, fatty matter, creatine, peculiar nervous matter, and salts or ashes. Their relative amounts of these constituents you will see at a glance on consult-

ing Table No. 3. Ozmazome is the peculiar flavouring principle of flesh, of broths, and soups. Ordinary meat contains about one-seventh of its weight of fat and cellular tissue. The pure lean of meat contains three-fourths of its weight of water. Of the remaining dry matter, about the half is carbon. The ultimate composition of flesh and blood is identical. Meat might be called solidified blood, and blood liquid meat. The *fibrine* of flesh is uniform in composition from whatever animal obtained. Roasting and boiling in no way alters the composition of flesh. The flesh of the wild animal is much darker than that of the domesticated kind, and is nearly devoid of fat. Young meats abound in gelatine. I here give the ultimate composition of flesh and blood.

			ROASTED FLESH.		
	Ox blood.	Dry beef muscle.	Beef.	Veal.	Roe Deer.
Carbon . .	51·95	51·83	52·590	52·52	52·60
Hydrogen .	7·17	7·57	7·886	7·87	7·45
Nitrogen .	15·07	15·01	15·214	14·70	15·23
Oxygen . .	21·39	21·37	24·210	24·91	34·72
Ashes . .	4·42	4·23			
	100·00	100·00	100·000	100·00	100·00

P.—What are the conditions in flesh that conduce to facility of digestion?

P.—Tenderness of fibre and minuteness of its division. The former is influenced by the age, sex, leanness or fatness, mode of death, and the state of decomposition of the animal. Venison, and most wild meats and game unite pre-eminently these characters, and they therefore hold the first rank for digestibility; young meats, as being more tender, are more easy of digestion than the flesh of very old animals. Veal and lamb, however, are exceptions, being less digestible than beef and mutton. I refer you to the tables drawn up from Dr. Beaumont, of the digestibility respectively of vegetable and animal substances.

P.—Does flesh meat alone suffice for human nutrition?

Dr.—Yes; it is a perfect aliment. It unites in itself all the organic and inorganic ingredients contained in animal structures; materials for every tissue, fibrine, albumen, gelatine, fats, salts, &c. Dogs fed on it, and in but small quantities daily, preserved uniform good health for many months, during which the experiment lasted. But three times the amount of isolated fibrine, with a liberal allowance of gelatine and albumen were insufficient to maintain life. Here it is the absence of the salts of the blood, of the elements of bones, &c. that destroy the nutritive virtue of the isolated principles.

P.—What are the alimentary properties of what you call cellular tissue?

Dr.—Now called areolar tissue. It includes tendons, ligaments, and cartilage or gristle. By boiling, these yield GELATINE. This by itself is non-nutritious; and I very much question its nutritive virtue when combined with standard dishes. It may, indeed, suffice to fill the vessels of the body, but assuredly such contents will conduce neither to health nor strength; but serve rather as the generator of disease.

P.—What is you opinion of the amount of nutriment to be derived from bones?

Dr.—Dogs subsist perfectly on them. Fifty years ago bone soup made a great deal of noise in France, but this was not extracted by ordinary boiling, but by the action of water and steam under pressure (Darcet's Apparatus). A bone was held as "nature's tablet of soup," and yielding as much soup as 6lbs. of meat. *Gelatine* was considered in those days synonymous with *nutritive matter*. It was tried extensively twenty-five years ago in the Parisian hospitals; but it was soon abandoned; at that time I did not know the reason of its failure; the testimony of all the medical officers was against it as "cheap and nasty," indigestible and innutritious. The very dogs refused it after once or twice using it!

P.—What do you say of milk?

Dr.—Its consideration we shall postpone for a little, till we speak of liquid foods. Meantime the products of milk, so to speak, butter and cheese, it may here fall in place to make a few remarks on. Milk holds a sort of middle place between meats and drinks, where we shall take it up along with the subject of eggs. Butter, I need not now tell you, is not a nutritive material, *i. e.*, it is not capable of supporting life. It is merely an element of respiration. Nevertheless, as serving to give a relish to farina-

ceous food, as fat does to lean meat, it aids nutrition by promoting digestion, &c.; its use is almost of absolute necessity in combination with such food. Few relish bread without butter. It is only difficult of digestion when in excess relatively to the other contents of the stomach. Melted butter, for the reason before given, is obnoxious to a weak stomach.

P.—What is the dietetic nature of cheese?

Dr.—Cheese is simply the coagulated *caseine* of the milk, freed from the whey by pressure, and charged with a certain proportion of butter. The piquant flavour of old cheese depends on the development of the fatty acids of butter. The *mould* of cheese is composed of minute *fungi*. Caseine is replete with the elements of the blood.

P.—What truth is there in the old proverb—

"Cheese is a surly elf,
Digesting all things but itself?"

Dr.—Much. Cheese in a *minute portion* is an excellent condiment. Used as such the best cheese is in every way calculated to draw forth, by its pungent qualities, the secretory energies of the stomach, and stimulate its muscular movements, and thus promote the digestion of a meal. But beyond this dose, that is, when taken as a principal article of diet, with bread (as by labourers), only the stomachs of labourers can digest it. Even they find a few ounces of bread and cheese, if taken in nearly equal proportions, as much as they can eat for a meal, and it holds them longer, they affirm.

P.—Will you favour me, then, with your remarks on the alimentary properties of birds?

Dr.—These after beasts, if not equal to them, furnish to man the substances richest in reparative materials. Every kind almost of the bird class is suitable for food, except the birds of prey, which our prejudices revolt against. Here, of course, we can only speak of those most common at our own tables, the common fowl, the duck, the goose, the turkey, the pigeon, the partridge, grouse, the pheasant, woodcock, &c.

The flesh of birds differs from that of quadrupeds in never being *marbled*, never having fat intermixed with its muscular fibres. Its difference of composition is seen by referring to Table No. 2. The muscles of the limbs most exercised are always the toughest. Hence for tenderness eat the wing of the bird that walks (as the

partridge), and the leg of the bird that flies (as the woodcock). For this reason, the breast of all birds is the juiciest and most nutritious part. In proportion to the age of birds, their flesh gets tough. In the common fowl and turkey, called *white-fleshed*, the ozmazome is deficient; they are the least stimulating of animal foods, and readily digestible. Chicken, if swallowed in mouthfuls without mastication, would be more difficult of digestion than beef, because its texture is close, and does not allow the interpenetration of the gastric juice so easily as the looser fibres of the beef. But eaten with small morsels of bread, and well-chewed (as all animal food should be), its cohesion will be sufficiently broken up. This is the reason that young gelatinous animals, as sucking pig, veal, &c., are so refractory to weak stomachs. The gastric juice has to corrode them piecemeal, as a bit of gum is dissolved from the surface inwardly.

GAME are usually dark-fleshed; they are richer in ozmazome, more stimulating, and, I consider, equally, if not more, digestible. Too *high* it is pernicious. GOOSE and DUCK are fatter and heavier foods, but well adapted for the robust. For the relative digestibility of some I advise you here to refer to Dr. Beaumont's table (No. 4).

P.—*Apropos* of birds, what is the nutritive value and digestive qualities of eggs?

DR.—It is a question whether eggs are most readily digestible in the soft or liquid state, or hardened by long boiling or baking. Fried they are objectionable to a weak stomach. Raw egg *whipped*, with sugar, brandy or wine, and cinnamon, is a favourite *restorative* cordial, but only allowable for the very weak or the very aged, and only when easily digested. No strong man or woman should require any restoratives but their plain ordinary meals. The raw yolk of an egg whipped is a substitute for cream in tea. A peculiar oil exists in the yolk of egg; it is suspended in water, by means of albumen, and enclosed in the membrane called the yolk-bag. This oil contains sulphur, phosphorus, iron, and cholesterine. Eggs are very questionable food for dyspeptics, and not particularly called for.

P.—I am not aware that in this country any REPTILE is used for food, except the green turtle.

DR.—That is enough; and it is very unduly praised. Their flesh is chiefly gelatine. It is occasionally dressed as a steak, but is almost exclusively used in the preparation of soup. What is

erroneously called the *green fat* are gelatinous morsels, the softer parts of the shields and fins. By boiling the flesh becomes white like veal or chicken. The fatty tissue is of a greenish yellow colour.

My estimate of the nutritive value of soups, and of this included, you will have presently, when we come to discuss the different preparations of food.

P.—Well, let me hear you out on the subject of FISH, and so conclude this day's conversation.

DR.—Fish has been in all times a large part of the food of mankind; some tribes have lived, and do still live upon it, wholly. The Ichthyophagi, among the Babylonians, as Herodotus described them, used it in a very sensible and scientific way, as do some of the inhabitants of Northern Europe. After being dried in the sun, they pounded it small in a mortar, and afterwards sifted it through fine cloth. This meal they baked into cakes. I believe if some of our beef was treated in the same way, under certain circumstances, it would make a most wholesome and digestible diet. Fat in various proportions might be mixed up with it. This is, in effect, the PEMMICAN of the Artic *voyageurs*, *their* staff of life, and one that never fails. The composition of the flesh of a few kinds of fish is seen in Table No. 2. It very speedily decomposes. In the salmon, the herring, the sprat, the eel, the pilchard, the flesh is more or less saturated with an oily matter, which after spawning is much decreased. In the *cod* and some others, the liver is the only organ which contains fat.

P.—What is the cause of the flaky arrangement of the cod and some other fish?

DR.—These are masses of muscular fibre which has contracted by boiling, and which separates from the adjacent muscles by the solution of the interposed connecting tissue. The interstices of these flakes is filled up with fibres of coagulated albumen, which has exuded from the muscular layers.

Fish is *in season*, or in perfection, at the period of the maturity of the milt and the roe. At this time the oily matter is most abundant, and the flavour richest. After spawning the flesh is soft, flabby, oilless, and good for nothing. This is the reason of the preference of deep sea herrings, which are fat, while those caught near the shore or in bays, have spawned or about to do so, and are consequently lean.

P.—What sort of fish is the most digestible?

Dr.—The *white-fleshed* are distinguished for tenderness, delicacy, and easy digestibility, as the whiting, sole, plaice, flounder, cod, haddock, turbot. They are also less stimulating to the system. The deep-coloured fishes, as the salmon, are of a more dense and oily flesh, and are highly nourishing, but require strong digestive organs. Sprats are sometimes poisonous. The usual sauces are very indigestible additions to fish. Fish is much less satisfying to the appetite, and much less rich in nutritive materials than the flesh of fowls or quadrupeds. But in this quality a great medicinal virtue lies, for many cases, which the prudent practitioner will best know how to turn to account. Without starvation, we can thereby reduce the plethoric.

P.—Do you believe in the prolific or aphrodisiac powers popularly attributed to a fish diet?

Dr.—I believe it to be a vulgar error. The case of the New Zealanders (an ichthyophagous people), who have only three or four children in a family, does not countenance the idea. The Greenlanders and Esquimaux are not fair cases in point, because with them the influences of climate, &c., operate against fecundity.

P.—Well, is there a better foundation for the idea that skin diseases are brought on by eating fish?

Dr.—There is. I have seen some cases. Many species of fish, especially in tropical regions, possess poisonous properties. Cholera symptoms are a frequent result, or convulsions, fainting, and stupor, occur, or a scarlet blush or nettle rash appears. There is something of these effects to be laid to the score of individual predisposition, and something may be attributed to disease in the fish. Putrid smoked fish, as sprats or salmon, often occasion death.

P.—Shell-fish is the only other division of this subject remaining. Crabs and lobsters, prawns, shrimps, and oysters, I suppose, complete the list. On these I am anxious to have some opinions, which may be for me safeguards in travelling, and my guides at home. The discussion of the edifying topics of my schoolboy days, mussels and cockles, limpets, welks, and periwinkles, I shall agree to adjourn *sine die*.

Dr.—The crustaceous shell-fish are only fit to constitute the occasional dishes of robust, healthy, hardy, working-people. They often produce the poisonous effects of fish above alluded to. They are undoubtedly difficult of digestion. Their flesh, princi-

pally the muscles moving the tail and claws, is highly gelatinous, and therefore not very nutritive. What gives the piquant taste and smell to these animals, and that which constitutes their fascination for some appetites, is a resinous substance contained in the investing membrane of the shell. As sold in the markets they are usually underboiled, in order to their better keeping, a circumstance that does not tend to improve their digestibility. Prawns and shrimps are more delicate, and, perhaps, less obnoxious.

P.—The OYSTER is a dietetic article, the popular predilection for which I am sure you will justify.

DR.—It is certainly a delicious food in its way, when fresh and healthy, but although it agrees with strong stomachs, medical opinions are divided on the suitability of the oyster for dyspetics. I should advise the latter not to touch them; many safer articles are at hand. Oyster sauce is, unmistakably, indigestible.

P.—Is not the green parts of certain oysters poisonous?

DR.—Such are certainly to be rejected as diseased. This colouring matter is most likely the bile of the animal, *overflowed*, in popular parlance. The notion that it is produced by the mollusc lying on coppery beds is unfounded.

CONVERSATION FORTY-THIRD.

Of liquid foods.—i. *Water;* ii. *Milk;* iii. *Tea, coffee, chocolate, and cocoa;* iv. *Fermented liquors.*

PATIENT.—WILL you proceed to-day with the elucidation of the chemical composition and dietetic quality of the various sorts of drinks?

DOCTOR.—Drinks, I need not say, go to constitute part of our daily food, as means of repairing the liquid waste of our systems, as vehicles for it, as whetters or inducements to it, or as qualifiers of qualities that require counteraction, as a solvent of solid or refractory substances, or as stimulants to aid the labour of the stomach, and also as taking a part in the formation of the solid structures

of the body, the medium of its chemical transformations. These are the objects with which drinks are taken. Water is the basis of all fluids, the vehicle of transport of the nutrient particles to all parts of the organism. I shall begin with the simpler, and go on to the more complex drinks. Of WATER I have already spoken as a primary and principal constituent of all food. *Seven-eighths* of the body is water. Air, food, and water, are the feeders; the stimuli and sustainers of all vital processes. The latter is derived from the fluids we drink, and the solid foods we eat. It is being constantly wasted by evaporation, and by the work and wear of the mechanism, and by the excretions resulting therefrom. It will be interesting here to refer to the Table (No. 2) showing the quantity of water in various alimentary substances.

P.—I suppose attention to the *quantity* and *quality* of the water consumed, is of great consequence in a dietetic point of view, especially in the treatment of disease?

DR.—So important is it, and so precise and definite are the rules and reasons of it, in each case, combined with its external application, that it constitutes a science; a science both of prevention and of cure, the science to which I have the honour and happiness of devoting my life. Here I shall dispense with speaking of any but *common waters*. The waters of the ocean, and mineral waters, I leave for the present to their respective patrons, being both good remedies in their way, that is, to those who understand how to use them.

P.—What would you say are the characteristics of good drinking water?

DR.—1st. It should be *tasteless*, and equally void of *odours* and of colour. 2nd. It should be nearly of a *uniform temperature* in every season; glacial draughts of water in winter being quite as much to be avoided and as repulsive to our instincts, as the debilitating, unrefreshing, luke-warm water we are often condemned to drink in summer. It should be *pure* and light, gaseous and lively, in a word, to every sense and in every way, *agreeable*. I must qualify for you the word *pure*. By pure, I mean free from all organic admixtures, and with the smallest quantity or property of inorganic constituents; otherwise water may be deprived of its salts, and of atmospheric air, and thus be in the highest sense, pure, as distilled water, without being either light or wholesome. A very minute quantity of saline ingredients, as chloride of sodium, and carbonate of lime, with abundance of atmospheric air, and

carbonic acid gas, is useful in good water, renders it, in fact, *nutrient*, because containing necessary materials of assimilation. By a providential arrangement all the best springs are provided with them. The decomposition of some of those in the stomach saturates its acids, and stimulates its mucous membranes, by the carbonic acid gas disengaged. But it is found that the more water is charged with its saline ingredients, beyond a very infinitesimal proportion, the heavier it is upon the stomach. Lastly, good water should form no deposit in boiling, leave no crust in the kettle, should cook vegetables and meat without hardening, and in washing with it should be oily, as it were, to the skin, and should not decompose the soap. Such water will never disturb the digestive organs, occasion no weight in the stomach, if suitably used, and is admirably fitted for the health-restoring process of the water cure. Such water, we can truly boast is our famous Malvern water; to the sound man a sufficient and salutary *tipple* in itself, without the addition of any stimulant. To the invalid it is beverage alike grateful and refreshing, and one that carries with it the elements of life and health to every tissue and organ, to every nook and cranny where it penetrates; to say nothing of its salutary *scavenger* operation, as it courses along the complicated sewers, canals, and conduits of the body.

P.—What is the specific objection to water charged with animal and vegetable *débris*, or decompositions?

Dr.—If strongly contaminated with such matters, it is one of the most certain causes of epidemic diseases, and this not to human beings only, but to animals as well. Dysentery is, perhaps, one of the commonest results of the use of impure or putrid water. In campaigns this often creates a greater loss of troops than even battle.

P.—What are the peculiarities of *rain* water?

Dr.—It is the purest of all waters when collected in the open country. At the commencement of a shower, however, it is usually loaded with impurities, suspended, especially in the inferior regions of the atmosphere; as carbonaceous and calcareous matters, with sulphates, chlorides, and *carbonate of ammonia*, are its chief ingredients, the latter arising from the decomposition of organic matters. Hence that collected in large towns often contains a decided smell of perspiration and animal excrements. It is this salt which imparts to such water its *soft* feel. Liebig contends that it is this atmospheric ammonia which supplies plants

with nitrogen. The purer water is, the more apt it is to decompose lead. Hence rain-water, as containing fewer saline ingredients than other waters, is more apt to be contaminated with lead from roofs, pipes, and cisterns.

P.—How does it happen that *snow* water is so heavy and disagreeable?

Dr.—Because it contains no air. Fish cannot live in it. It does not quench thirst. Nevertheless when melted and *whipped*, to put air into it, it has been a great resource to the ships' crews in even Artic expeditions.

P.—Wherein does *spring* water differ from rain, and from river water?

Dr.—Spring water, having percolated the soil, of course takes up the soluble matters it meets with in its course. Its ingredients differ according to the strata of earth it has permeated. *River* water is a compound of the two former. If flowing over a sandy or pebbly bed (which acts as a sort of filter), it is very pure. It is usually loaded, however, with decomposing organic matters. After receiving the tribute of the sewers of towns, it is, of course, abominable, intolerable. A gallon of Thames water, taken at Chelsea, contains sixteen grains of carbonate of lime, three grains of sulphate of lime and chloride of sodium, and nineteen grains of solid matters held in solution. We can imagine what pump water must be in the neighbourhood of church-yards, and what its influence on the health of the inhabitants. Sir James Macgregor relates that, at Ciudad Rodrigo, where 20,000 dead were buried in the course of a few months, those exposed to the emanations from the soil, as well as obliged to drink the water of the wells, tainted by the oozing from this *aceldama*, were affected by typhoid fevers, and especially by dysentery. Thames water becomes fetid at sea from the immense quantity of decomposing matters.

Sulphuretted hydrogen is evolved from decaying organic matter, when in contact with the salts of sulphur, which they decompose. Professor Daniell explained, in this way, the fatal miasma of the Western Coast of Africa, where the waters are largely impregnated with sulphuretted hydrogen.

P.—Are the animals which are usually exhibited to us by the microscope in a drop of water, a fair criterion of what exists in the water we are daily using?

Dr.—By no meams. The drops of water in question are obtained from stagnant pools.

P.—Are there any peculiarities in pump or well-water?

Dr.—It is usually *hard*, from the excess of sulphate and bicarbonate of lime?

P.—Explain the curdling of soap by hard water.

Dr.—What chemists call *double decomposition* takes place, the sulphuric acid of the sulphate of lime, for example, being set free unites with the alkali of the soap; the fatty acids of the soap set free unite with the lime, forming an unsoluble earthy soap. The carbonates have but a very slight action on soap. I have remarked this in the water used in London, although highly charged with carbonate of lime. In these cases the carbonate is held in solution by the excess of carbonic acid, which prevents its reaction on the oily matters of the soap.

Hard water, as being a bad organic solvent, is ill adapted for making infusions, as tea, soups, brewing. It is also bad for the dyspeptic. Cattle will not drink such water, if they can help it. It makes their coat "stare."

P.—You said that pure water corrodes lead. How is this?

Dr.—That is, when air is not excluded; but when this is admitted a thin white crust, composed of carbonic acid, oxide of lead and water. The neutral salts contained in spring water protect it from the corrosive action of air and water on lead. The sulphates are the most protective; the muriates least. But when the cisterns have leaden covers such water is found contaminated; because the water spontaneously evaporating condenses upon the lid. This *pure* water exerts its usual action on the lead, and drops back into the cistern, with its *dose* of lead. Lead is also acted upon by water galvanically, in cases where iron and lead are in metallic contact, as in the bars, supports, and fastenings of cisterns.

P.—The purer water is, the worse vehicles for its conveyance are leaden pipes. That is something to know. What do you say of the water of lakes, canals, marshes, &c.

Dr.—In proportion as water is quiescent does it become loaded with putrescent matters. Marshes present the maximum of these pernicious elements. Drinking of marsh-water produces the same effects as the marsh-miasm. The specific action of water on the human organism is a subject that will interest you much. Its consideration, however, I defer till the next "Part" of these conversations, where we discuss the *modus operandi* of the water-cure processes.

CONVERSATION FORTY-FOURTH.

Condiments and Seasonings—pepper, spices, salt, vinegar, and vegetable acids.

PATIENT.—WILL you be so good as to explain your views of the nature and action of condiments, or the seasonings we take with our food—how far they are necessary, how far they may be dispensed with?

DOCTOR.—There is an intimate sympathetic relation between the gustatory impressions and the salivary and gastric secretions. A condition essential to the due digestion of any food is *that it be relished.* That which increases the agreeable flavour of foods, while it gratifies the palate, promotes assimilation. What is repugnant to taste, or smell, or sight, proves equally repugnant to the powers of the stomach, and fails to call forth the nutritive energies of the system. Now the virtue of condiments lies in their sapid, aromatic, or *tasty* principles. They are dynamic agents, if you like. Many of them contain pungent volatile oils. These stimulate the organs of smell and of taste, as well as the glands, nerves, and blood-vessels of the mouth and stomach, augmenting the digestive secretions, circulation, and movements, promoting assimilation, and accomplishing at the same time a general physiological stimulation, as shown in the feeling of *bien être*, of ease, and exhilaration they diffuse over the economy. They often also correct injurious qualities of the food with which they are taken. Whether in consequence of their stimulating the nervous centres, or by being absorbed into the circulation (not so probable), condiments often call up a powerful re-action from the centre to the surface.

P.—It would seem, then, that the dietetic habits of peoples and nations are not the result of mere accident, or senseless fashion, but lie deeper, originate, in fact, in grand laws of the living organism. They are adopted because found innately suitable to certain felt wants, or instincts of our bodies.

DR.—How happy should we be, could we always listen, attend to, and duly interpret this corporeal voice—the expressed wants of our organisms.

P.—It is not, then, for any elements of nourishment they con-

tain in themselves, that condiments are valuable, but that they contribute to nourishment.

Dr.—No. They are a sort of *tipples* in their way, means of acting especially on the nervous life, and enabling us to intensify this at pleasure, to rouse up depressed corporeal power. But recollect, that their true use is always in connexion with food, that is, with the full and active state of the stomach, and only when such aid is necessary to be invoked, when digestion perhaps requires a *fillip*, or to be flogged up to due action. Otherwise, *on the empty stomach*, in its passive state, they irritate rather than produce any healthy secretory efforts.

P.—Do not some physiologists condemn the *use* of common salt?

Dr.—I never heard of but one that did, and he on insufficient grounds.

P.—The universal relish and desire for salt amounts to an instinct.

Dr.—It does, and is an unperverted instinct too. Salt may be called an essential of life, and is in universal use. It is, in fact, a true alimentary substance, as requisite to the composition of the solids and fluids as albumen, fibrine, fat, sulphur, or phosphorus. Salt furnishes the hydrochloric acid, and the soda of our secretions and tissues, in which they exist free, or combined with various bases. The alkaline constitution of the blood and bile depends upon its soda. Salt even plays a part in the phenomena of respiration. According to Liebig, it converts into phosphate of soda, a part of the phosphate of potash, which exists in the blood, either directly introduced by the food, or resorbed from the tissues. Now, of all other salts, the phosphate of soda is the best fitted for the absorption and elimination of carbonic acid. A French physiologist asserts that salt forms in the alimentary canal soluble compounds with certain dietetic substances, thus facilitating the absorption of the latter.

P.—According to your *dynamic* doctrine of the action of condiments, this much is clear at least, that the stimulation of the mucous and salivary secretions of the mouth are propagated to the stomach, whose capillary circulation, gastric juices, and muscular movements are all thereby increased.

Dr.—Precisely so. There is more perfect digestion, and consequently a greater amount of nutritive materials elaborated from

the same quantity of food. In this way, the use of salt has been clearly proved to conduce to the fattening of cattle.

P.—What is the action of vinegar and vegetable acids?

Dr.—Introduced in small quantities, they have evidently an antiseptic tendency, they maintain the due constitution of the blood. They excite the mucous and glandular secretions, provoke the appetite, appease thirst, aid the solvent power of the gastric juice, and quicken the peristaltic movements of the bowels. They have an attenuating effect on viscid or mucilaginous substances, and therefore aid their digestibility.

P.—But condiments, I suppose, like everything else, are liable to abuse, and must be guarded from abuse to be salutary, to earn a good name, and to shield themselves from the assaults of the philanthropic knight-errants, the would-be scientific Quixotes who can tilt against all *abuses*.

Dr.—Of course. Too concentrated, or in excessive dose, they appear to dry up the gastric secretions. Their abuse weakens the digestion, deranges their sensibility, and perverts nutrition. Hence the general emaciation the excessive use of vinegar especially will produce.

P.—*Sugar*, as a seasoning, is now become almost as indispensable a necessary of life as *salt*.

Dr.—It is as universally agreeable, although of savour quite opposite, and it is suitable to every age, constitution, and climate. By exciting abundant secretions and stimulating the stomach, it facilitates digestion. It furnishes a copious chyle, and favours the formation of fat and bile.

P.—*Apropos* of fat, or oily matter, is not that a great condiment?

Dr.—This is independent of its utility and action as an element of respiration. Hence, as used in southern climates, where oil is not demanded as an animal fuel, it serves to correct the pungent qualities of the spices and acids abounding in the diet, as well as to give the necessary smoothness, softness, and pliability to the internal textures generally, and mucous surfaces in particular, which would otherwise acquire a harshness and dryness from the excessive waste of the frame in perspirations.

P.—Will you kindly specify the cases wherein the use of condiments is expedient?

Dr.—Their use is relative; it depends on circumstances. 1st. In the case of insipid food, in tasteless farinaceous or mucilaginous

vegetables in white flesh, they are calculated often to double both their reparative power and digestibility. 2nd. Climates and localities decide their use. The native of the tropics excites his languid digestive functions by stimulating spices and condiments. In fact, he could not live without them, so much is the energy of the vital centres exhausted by the excessive activity of his cutaneous functions. I admit that the great abuse of these and other stimulants in hot climates, and the general disregard of physiological laws, the fast living of "the burning children of passion," as they are called, to a great extent abridges the natural term of their existence. In cold humid regions, and in the frozen north, oils, and fats, and alcohol, are the stimulants chiefly craved for. *Hot* tea and coffee are, in such circumstances, truly condimentary stimulants to the digestive mucous engorged from languid cutaneous action. In the 3rd place, the use of condiments is relative to individual conditions, to age, sex, constitution, health, habits. As a general rule, high seasonings are improper for the bilious and the nervous, but are sometimes suitable for lymphatic subjects, and for old men. In giving you my parting advice on this subject, I should say, be sparing of condiments, dispense with them as much as possible, only use them when really required. They must be avoided in anything but the most minim doses by the delicate and the valetudinarian. To the *dyspeptic* they are particularly injurious.

CONVERSATION FORTY-FIFTH.

The digestibility of Foods.

PATIENT.—How do you explain the contradiction and disagreements of authors as to the digestibility of food?

DOCTOR.—This is referrible, in the first place, to the term or thing, digestibility, being ill-defined in their minds. In the next place, to faulty experiments; and, in the third place, to not duly taking into account the circumstances which hasten or retard digestion.

We must proceed by the mode of *exclusion*, to show what digestion is *not*. Some writers understand by digestibility *the time the food remains in the stomach*, which is a very fallacious test. For substances naturally indigestible, and whatever contains little nutriment are by a sort of instinct of the stomach first evacuated. For example, Dr. Beaumont infers that gelatine is easily digestible, because that after an hour it had disappeared from the stomach. The experiments of Tiedemann and Gmelin, as well as of Blondlet, are opposed to Dr. Beaumont's inference. In fact, the stomach made speed to get quit of it, as a thing useless for vital purposes, and therefore its presence in the vital laboratory an act of intrusion. Others understand by digestibility *the facility with which foods dissolve in the gastric juice. Fat* is on this account considered very indigestible. But, in fact, the gastric juice has no action on oily matters at all. They remain long in the stomach and are long in being absorbed. They are not intended to be digested, for they are not digestible. They do not need digestion. (Oil and water, I have before shown, are of large requisition in the corporeal structures; in fact, constitute their greater proportion; but they can scarcely be said to be *vitalised*.) Another contends that digestibility *is the relation that exists between the nature of the food and that of the gastric juice, and therefore the property which any specific alimentary article has of yielding most rapidly and easily the sum of its chylifiable elements.* This is Trousseau's idea; and I believe it comes as near the truth as any other. It expresses the relation that exists between the properties of an aliment and the actual condition of the organism, of which the index in this case will be the power of the stomach's secretions and actions.

P.—A varying relation of course in man's present artificial state?

Dr.—Yes, and it is the object of dietetic courses, of regimen, of physic, and physicians, to prevent or diminish this variation, so that the body's relation to the food shall be as uniform as possible. Thus what agrees to-day will not disagree to-morrow—the same food always exciting the same assimilative power.

P.—I should think the experimentation on animals as well as on man, with a view to elicit the relative digestibility of various kinds of food, to be one of the most difficult of researches?

Dr.—Yes. There is the different natures of the brutes, as well as their habits and natural dietetic repugnances, must be taken into account; in man, regard must be had to temper, disposition,

&c.; and in both reference must be made to age, idiosyncrasy, the sound or morbid state of the digestive functions, the general health, the corporeal conditions, whether of exercise or rest, the amount of excretory waste, the duration of the previous fast, the greater or lesser nutrient character of the diet the man or animal had been accustomed to, climate, heat, and hygrometric state of the atmosphere. It is the want of the accurate precision of all these circumstances, in fact, the entire absence of accurate information on any of these heads, that greatly detract from the value and conclusiveness of Dr. Beaumont's experiments on San Martin. Besides, most experimenters labour under the difficulty of experimenting on animals placed more or less in unnatural conditions.

P.—Well, what circumstances most affect the digestibility of foods?

Dr.—Those may be divided into two classes. Those relating to the alimentary substances themselves, and those relating to the individual. With respect to the first class.

Digestibility is essentially connected with the following conditions:—

1st. The preservation, as far as possible, of the natural form or primitive constitution of the food.

2nd. A certain quantity of excrementitious or unassimilable matter—at once as a diluent, divider, and vehicle of the nutrient portions.

3rd. An aromatic, piquant, or stimulating principle, which excites the stomach-lining, the digestion, sensibilities, actions, and secretions, either by direct impression, or by sympathy with taste and smell. This imponderable, unweighable, and evanescent element is distributed in a great variety of foods. The flesh of beasts, and birds, and fishes, and of every different kind has each its own aroma: so of vegetable products. Upon the *ozmazome*, or aromatic principle developed in cooked animal foods, much of their nutritiveness and digestibility depends. The bran contains what may well be called the *ozmazome* of flour. White bread is deprived of this. Some foods are naturally more difficult of digestion than others. Vegetables are slower of digestion than flesh and farinaceæ. It may be laid down as a law that the less digestible any food is, or the smaller the quantity eaten, the more rapidly it makes its way out of the stomach. Crude vegetables rapidly make their way out of the healthy stomach, while other

richer food remains. (*b*) Tenderness of fibre or minuteness of division, of solids whatever lessens the force of cohesion, which opposes itself to molecular changes. Violent exertion before death, for example, or incipient decomposition imparts tenderness to flesh. But lessened cohesion is not all. Young animals are more tender and soluble than the adult: yet the latter are more digestible. Liquid foods are less cohesive, but more indigestible, than solid foods. In this view thorough mastication and insalivation, promote digestibility. (*c*) Whatever is most grateful to the palate is, *cæteris paribus*, most manageable by the stomach. Hence the advantage of good cookery, it changes the organisation of the food; but does not alter its ultimate composition, and it lends flavours where they are absent, or heightens those that are defective.

P.—Next, what are those circumstances in the individual which affect the digestibility of food?

Dr.—States of mind and body—states of the passions—constitutional peculiarities—keenness of appetite—length of fast—the amount of waste produced by exercise, or by evacuations—the *heaviness* of the meal as respects both quantity and quality—moderate exercise after a light meal, and repose after a full meal. The necessity, or non-necessity of calorification is a very modifying element.

P.—The *absolute* digestibility of foods, is then, indeterminable—is a chimera?

Dr.—So is the *relative* digestibility, because of the diversities of individual conditions, indeterminable also, save by an immense number of experiments. The personal experiments and experience of the physician must guide to a certain extent: but this to be qualified and corrected by the experience of others, universal experience, and the facts elicited by the researches of scientific investigators.

P.—What saith Dr. Beaumont's table on that subject?

Dr.—To that I refer you. But the statements cannot be fully relied on. They are not philosophically accurate, the modifying conditions of digestibility are not calculated in the experimental result. I give you Dr. Beaumont's results, as M. Trousseau has well summed them up: 1. The flesh of beasts is somewhat more difficult of digestion than that of birds; and fish easier of digestion than either: roasted meats are more digestible than fried or boiled. Beef is a little more digestible than mutton, and the

latter than pork. Yet many persons with weak digestion can eat mutton with comfort, who suffer if they eat as much beef. 2. Common poultry is more digestible than game. 3. Fresh fish is more digestible than salted fish. 4. Milk food is more easily digested than any of the preceding, except fresh fish: boiled milk more easily than raw milk; cream than butter or cheese. 5. Broth or soup made from beef is as difficult of digestion as any of the meats under the first head. 6. The farinaceæ are as digestible as milk and fish. Bread is less easily digested than boiled rice (blanc mange) potatoes, &c. 7. Fresh (green) vegetables rank equal in digestibility with the flesh of birds. 8. Fruits are the most easily digestible of all.*

M. Blondlet followed Dr. Beaumont in experiments on dogs, with artificial gastric fistulæ. He studied the action of the gastric juice first on simple alimentary principles, and then on compound aliments, by two simultaneous methods, 1st, the natural stomach-action itself; 2nd, with the same substances in gastric juice taken from the stomach of a dog, and placed in a bath of the temperature of the body. His results may be thus summed up:—

I. THE AZOTISED PROXIMATE PRINCIPLES.—1st. *Fibrine:* natural digestion, one hour and a half; artificial, from two to three hours. 2nd. *Albumen*, white of egg, raw one hour and a half; coagulated from five to six hours: its artificial digestion lasted from three to twenty-four hours, according as the degree of division or compactness of the mass. 3rd. *Gluten* (from wheat), five hours and a half. 4th. *Caseine*, coagulated, three hours and a half, hardened by boiling, seven hours. 5th. *Gelatine is not coagulated by the gastric juice.* 7th. *Mucus*, in any form, is incapable of being acted on by the gastric juice.

II. THE NON-AZOTISED PROXIMATE PRINCIPLES.—1st. *Fatty matters* pass the stomach without alteration: nor are they altered by the action of the gastric juice out of the stomach. The pancreatic juice forms an emulsion with them which facilitates their absorption. 3rd. *Pectine* (vegetable jelly) is simply dissolved. 4th. *Gum*, the same. 5th. *Sugar* is subject to the alcoholic and lactic fermentation. According to Blondlet it is not acted on by the gastric juice neither in the stomach nor out of it. It is apt to induce an influx of bile into the stomach; sugar favours the formation of bile and fat. 6th. *Fecula*, or *farinaceous matter*, crude,

* "Thése du Concours d'Hygiène," p. 24. Paris, 1837.

uncooked, and mixed with cold water, is simply suspended in the secretions of the stomach, its grains rest intact. 7th. *Lignine* (woody matter) and the envelopes of seeds and fruits, are totally unaffected by gastric juice. 8th. Resins, the same.

III. COMPOUND ALIMENTS. 1st. *Cellular tissue* (areolar), that is, concreted albumen with gelatine, enclosed in a muslin bag, digested in the stomach of a dog in an hour and a half. 2nd. *Muscle* (raw) digested in from four to five hours. Roasted meat, as well as raw meat, was attacked only on the surface layer by layer: while boiled meat, and veal, and chicken, and fish, being more spongy and permeable to the gastric juice, were more rapidly chymified. 3rd. *Fibrous tissue* is very refractory to the gastric juice, requiring *ten* hours to digest. 3th. *Cartilage* is more easily digested. 5th. Bones are easily digestible in the stomachs of the carnivora. Its organised part is dissolved like fibrous tissue. The calcareous matter simply falls away as powder, and constitutes the bulk of the excrement. 6th. *Parenchymatous tissues:* liver and lungs remained four hours in the stomach of dog; brain only two hours.

Milk is instantly coagulated in the stomach. The caseine is precipitated involving a portion of butter with it. Another portion of the butter floats on the surface of the mass. The sugar remains dissolved in the serum. The caseine is slow and hard of digestion. Milk alone is not an aliment very easy to digest. It is only digested as a solid substance. The more compact and bulky the morsels of curd, the more difficult it is to digest. Therefore, milk is most digestible when associated with other food (as bread or potatoes), which breaks up the curd into small masses by its interposition, and multiplies the surfaces of contact.

P.—You intimated that experimenters were apt to confound the quickness of the digestion of an aliment with the rapidity of its ejection from the stomach. Do you not think that such a mistake has often been committed by Dr. Beaumont? All praise to him for what he has taught us of new and useful on the subject of diet and digestion.

DR.—Undoubtedly. You may solve many of the anomalies of his table by this consideration. In proportion as aliments are deficient in nutritive principles, they early discharge themselves from the stomach. This may be said of all fresh vegetables and fruits. The more highly nutritious substances, as beef and bread, remain in the stomach, until their entire elaboration. Much de-

pends, as regard the early emptying of the stomach, on the quantity of the food taken, as well as its quality. But it is a grand fallacy to consider the whole act of digestion accomplished in the stomach. I am quite convinced that a vital elaboration of what portions of the food has reached the CÆCUM unchanged, or nearly so, there undergoes further assimilative changes, so as to extract all the *pith* of the food that the wants of the economy demand. This is especially the case with succulent vegetables, as green peas, haricots, cauliflowers, cabbage, turnips, carrots, parsnips, salads, &c.

P.—Your doctrine, then, is, that the more nutrient matter any food contains, the more labour it exacts of the stomach, the longer it will remain there, and, if the patient be dyspeptic, the heavier it will feel, and *per contra*, the lighter a diet is, the less nutritive it is, the shorter time it remains in the stomach, and the less uneasiness it will produce to the dyspeptic. Hence I infer the *theory* of your practice in the treatment of stomach complaints is, tasking little the stomach, and less the energies of the system, so as to save the stomach elaborating unnecessary supplies; in fact, giving the organ as much rest as possible, compatible with introducing just sufficient nourishment to enable the machine to work easily and comfortably.

DR.—You have caught my idea. If we could nourish a man through his skin for a month, and give the poor jaded stomach, pylorus, and duodenum, *entire* rest during that time, it would suffice to cure maladies that will otherwise take a year or two to remove. So many incurable heart and lung diseases would get well soon, if we could find a substitute for the labour of these organs. The *brain* we can spare. Hence the imperative law in hygienic establishments such as these, to avoid any mental effort that excites.

P.—Does the body ever digest more than its real wants demand?

DR.—I believe not, as a general rule. I think Dr. Beaumont is quite right in his assertion that the amount of gastric juice secreted is the measure of the corporeal wants. *A priori*, I should infer that the Creator would make such an arrangement, for the protection of the organism from the effects of excess, as he has placed other checks to excesses of other sorts. I think it will be found a sound principle, that the healthy body only appropriates that which is necessary for the reparation of its waste. The super-

fluity is a burden till eliminated *per vias naturales.* People who get gross, fat, and unwieldy, do not do so from excess of bone or muscle, but from excess of adipose tissue, that is, from the superfluity of *non-azotised* materials in their diets, fat, and oils; matters which once in the stomach, find their way into the circulation by simple absorption, without any digestive transformations. The excess of sugar and starch in the food is drained off in the shape of water, as any one may convince himself by living on rice, and drinking no fluid for twenty-four hours. In fact, an excess of starch is not acted on by the digestive organs. It passes unchanged, or nearly so, through the bowels. This explains the frequent and copious evacuations of vegetarians with great appetites. The carbon of the excess of sugar and starch is eliminated in the shape of bile.

P.—You hold, then, that the albuminous or proteine compounds are alone chymified?

Dr.—I do. Mucus, resin, woody matter, oil, fat, even starch (crude), sugar, and liquid albumen, undergo no chemical changes by the gastric juice, but form with it a simple solution or emulsion; the same as in water, sugar is subject to the alcoholic and lactic fermentation.

CONVERSATION FORTY-SIXTH.

The nutritive power of Foods.

Patient.—I suppose the nutritive power of an alimentary substance is represented by the amount of assimilable materials it contains?

Doctor.—Yes; the more or less azotised (or nitrogenised) nature of its ingredients, is the sign and measure of its nutritive power. Azotised matter is the substratum of the organism; it, as it were, makes up its *weft and woof.* It also constitutes the essentially assimilable part of foods. Man's continued existence depends on the daily reception of as much nitrogenised matter as

the wear and tear of his system daily expends or loses. It is an assumption, as yet uncontradicted by any positive fact, that man does *not* appropriate the atmospheric nitrogen, but only in the minutest proportion, and perhaps in exceptional cases. The Creator has appointed this element to be supplied in his diet. Plants elaborate the carbon, the oxygen, the hydrogen, and the salts, &c., which enter into the diet of animals, so they also elaborate his nitrogen. The atmospheric nitrogen exists free as it does, not for man's direct use, but *for the direct appropriation of plants.*

P.—The substances, therefore, most replete with nitrogen, will be the nutrient aliments *par excellence.*

Dr.—Yes, provided they contain the due proportion of *salts* or *ashes;* so the proteine compounds (fibrine, albumen, caseine, gluten, legumine, vitelline, &c.) in which the nitrogenous element predominates, constitutes the bases of human nutrition. One of these nutritive principles abounds in all the aliments of men or higher animals. The relative amount, therefore, of neutral azotised matter in any article determines its suitability for repairing the waste or providing for the growth of the fabrics. There is thus, as you will perceive, an entire analogy or identity between the food necessary and destined for man, and the manures applicable to land under culture, manures whose value is in proportion to the amount of nitrogen and salts they contain.

P.—The existence, then, of nitrogen in an alimentary substance being the essential condition of its nutritive power, to ascertain the amount of immediate azotised principle is to determine its dietetic value?

Dr.—Mark, however, that the nutritive value of a food does not, in all cases, depend on the absolute amount of nitrogen it contains, *but on the quantity it yields to assimilation.* A highly albuminous substance may be hard of digestion, and not yield all its nutritive elements; a much less azotised product may be easy of digestion, and yield all its azote, &c., hence be more nutritive than the other.

P.—I must then distinguish the fundamental elements of nutritive power in foods from the conditions which regulate its development in any individual?

Dr.—You must.

P.—What may these conditions be explicitly?

Dr.—They are essentially the same as those which promote the

digestibility of foods. 1st. Azotised food nourishes well and long only on condition of being, as much as possible, in its natural state, the original union and elaboration of its elements unchanged. Hence separate alimentary principles will not suffice for nourishment. Bad cookery often perverts good food in this and other ways. To present the living system with *chemical products* for substantial aliments, is giving it a stone for bread. Mutton, and the *proximate principles* which represent it, or make it up, are very different things. 2nd. Perfect digestion, the due extraction of nutrient matter, depends on a certain amount of bulk in the food. A certain proportion of non-azotised and non-nutritious matter is necessary to perfect nutrition and facile digestion, concentrated food is indigestible and innutritious. An innutritious or excrementitious portion of the food serves to break up the cohesion of the azotised and nutrient matters, or to develope their latent activity, and to expose a greater amount of their surface to contact with the absorbents of the intestinal track. A subordinate, but not less essential function of the woody or excrementitious part, is to maintain the peristaltic movements of the stomach and bowels. 3rd. Diversity and mixture of foods is a law of man and some animals. A rabbit fed exclusively with wheat, barley, carrots, &c., will only live a few weeks. If they be given together, or alternated, they answer perfectly. The mixture of meat augments not only the digestibility, but the nutritive power of bread. Animals fed exclusively on bread, presented starch throughout the whole length of the intestinal canal. When meat was added to it, the starch was only found at the end of the small intestines. 4thly. The sapid, odorous, or aromatic principles of the food. These, although infinitely minute and evanescent, determine a flow of blood and secretions, a vital orgasm and turgescence, which enables the stomach to react upon the food ingested, and to extract their assimilable principles.

P.—What are nutritive equivalents?

Dr.—They are numbers representing the comparative nutritive power of dietetic substances, numbers expressing the quantities of each aliment that suffice to afford the same amount of reparative materials. (See Appendix.)

CONVERSATION FORTY-SEVENTH.

PATIENT.—WHAT is the foundation of varieties of regimen, or dietetic observances?

DOCTOR.—All circumstances, bodily and mental, which modify the living organism, age, constitution, temperament, habits, exercise, or rest, diseased conditions, &c. &c. All these infinitely modify the kind and amount of corporeal waste, as well as the effects of the food taken. Nutrition has its laws, as we have endeavoured to show, and their scientific application to the diversified circumstances of man, constitutes regimen. One person, for example, will draw more nourishment from a vegetable diet than from meat, which would over-excite the digestive organs, and heat the system generally. Another cannot live without his allowance of animal food; his flesh wastes, his blood becomes watery, and there is no strength or spirit in him. One man cannot exceed his usual quantum of food without seriously deranging his health; another man lives by no rule, and commits all sorts of excesses with *apparent*, or comparative, impunity.

P.—Well, what would you call a normal ration for a man?

DR.—That is very hard to determine, so diverse is the condition, exercise or labour, habits and constitution of men. A Russian soldier's allowance is a pound of black bread per diem, with some oil. Our sailor's ration is about two pounds, between bread, and beef, and et ceteras. Cheyne assigns to a man of average stature, in good health, and taking moderate exercise, eight ounces of meat, and twelve ounces of bread or other vegetable nourishment; with sixteen ounces of fermented liquor. This is very near the mark. Sir John Sinclair reckons sixteen ounces of solid food, and thirty-six of liquid for sedentary people. The quality of the food determines greatly the quantity necessary. One pound of bread will nourish a man under light labour, who would otherwise eat five pounds of potatoes. A person living on apples would perhaps require ten pounds per diem. A ration of beef would permit an immense reduction of the farinaceous element in the diet. The principle is clear, that the corporeal *income* should be proportionate to the expenditure. The latter, of course, presents great fluctuations, according to causes acting on the organism, and modifying the vital functions. An instinctive feeling, ema-

nating from the stomach, suggests, both to man and beast, the fitting conduct relative to their food, although in the case of man these instincts are wofully perverted and de-naturalised. The sound man will find his surest dietetic guide in his sensations. Temperance is the grand rule. The just measure of food once obtained and pursued will be confirmed by habit. Nature suffices with little. Most people consume much more than the support of life demands; and infinite, unknown, are the mischiefs that arise from overcharged stomachs. The more one eats, the more one *would* eat, the more gluttonous one becomes. The high refinements of cookery, in this way, are particularly injurious; they over-stimulate jaded organs of taste and smell, producing a factitious appetite, and overstretching the capacity of the stomach.

P.—What is the *body-conscience* doing all this time?

Dr.—Oh! that instinct of organic preservation cannot be entirely silenced, or seared. When its warnings are not heard or heeded, derangement of the health ensues, sooner or later, and more or less serious. The habit of excessive nourishment degenerates at length into a real need of the economy, and gives an undue preponderance both in size and activity to the digestive viscera.

P.—What are the morbid effects of a too profuse diet?

Dr.—They vary, of course. It does not create the sanguine temperament; but in such a temperament it produces venous plethora, piles, a disposition to active hæmorrhages and to cerebral congestions. The urine, the principal outlet of the azote of the system, evacuates an excessive proportion of solid materials: and all this is an unnecessary strain upon the kidneys, superinducing disease in structure so overworked. But, *at the best*, it becomes insufficient for eliminating all the azote received into the body through an excess of nourishment. This superfluity it allows to deposit itself in the shape of uric acid, the *materies morbi* of *gout, rheumatism, stone, and gravel.*

P.—How is it that many noted gormandisers do not get fat?

Dr.—Leanness is a frequent associate of gluttony. When the alimentary mass is greatly disproportional to the digestive ability, only so much as the actual wants of the economy demand is appropriated. The excess is eliminated in various ways, it makes exit usually by diarrhœa, or vomiting, after a painful stay in the stomach. Infants, by their facility of vomiting easily, get rid of their excess of nourishment. Adults undergo the painful

crisis of indigestion, announced by nausea, hiccup, fetid eructations, headache, vomiting, with troubled respiration and general pallor, with fatigue and weariness of the limbs. Sometimes the pylorus yields, and allows passage—but not without *protest*—to the undigested mass, which irritates the intestinal mucous membrane, as it courses along, producing diarrhœa. The apoplectic, and those with tendency to inflammation, frequently go through this process once too often.

Obesity, or fatty or oily infiltration, is slow to exhibit itself in persons of the sanguine and nervous temperament, who eat to excess. But it quickly gains upon the lymphatic, in whom all the excess of food turns to fat: the belly first becomes prominent, then it extends to the face and neck, the limbs often retaining their original slenderness. The weight of the body increases, while its moving power diminishes, by the atrophy of its muscular fibres. The mental powers diminish by the excessive stimulation of an excessive nutrition, working at high pressure the powers of plastic life.

P.—So true is Shakespeare's remark—

> "Fat paunches make lean pates, and dainty bits
> Make fat the sides, but banker out the wits."

What is the influence of indigestion in the production of disease?

Dr.—Great; provoked often, and especially when accompanied with the abuse of alcoholic liquors. There is no end to that subject. I will develope this at full length, and in some novel points of view, to you another day.

P.—Leaving for the meantime the discussion of the dietetic character, or adaptation of man—that is, the relation that exists between the quality of his food and his digestive capabilities, will you be pleased to give me some general views of regimen, of the effects and applications of vegetable diet exclusively; of its modification, a milk diet, and then of what is more properly termed a mixed diet?

Dr.—The nourishment of the healthy human being varies with the circumstances and epochs of life. A well appointed diet, especially in disease, is of infinite importance—indeed it cannot be over-rated or over-stated. But the diet, either of the healthy or the sick, cannot be determined by any absolute rule or prescription; it is entirely a matter of relation to particular cases and particular occasions. By varying the nature of the food, and its mode

of preparation, and its times of taking, we can meet many wants of the diseased organism. By regimen, it is in our power to supply the defects of many other hygienic conditions, to correct defective constitutions, and even to eradicate perhaps, or neutralise, hereditary taints and other faults of organisation. Next to air and climate, or I should rather say before either of these, it is the most powerful modifier of man's condition, moral as well as physical. Regimen is omnipotent to save or to kill, according as it is well or ill directed.

P.—I should like now to hear the results of your experience on the subject of the *times of eating*.

Dr.—The number and periods of meals are proportioned to the wants of the system, and are regulated by the circumstances of each individual case. The feeble and the robust, the young and the old, the active and the sedentary, the inhabitants of cold and those of hot climates, of moist and of dry climates, are all placed in conditions that demand corresponding variations of diet. So far as the habits are natural, and the health good, the returns as to the times of eating, as well as the dictates of appetite in regard to quantity and quality of food, may be safely relied on. But an imperative rule is, that there be always clear ground for a meal—that the last be duly disposed of, and out of the way—the stomach empty before a fresh meal is indulged in. If food is ingested while the stomach is at work upon an undigested previous meal, disturbance is sure to occur, although in strong constitutions many things may mask that disturbance, and they *appear* to escape with impunity. But no violation of an organic law, any more than of a moral or material law, can be without its fitting check or penalty sooner or later. Much food is eaten that is not digested. The bowels are merely put to the trouble of releasing the system of a load that should never have been introduced to it, and this gratuitous evacuation, though the saving of the individual for the moment, is the ruin of the organism in the long run. It is like playing tricks with a steam engine, risking the bursting of the boiler, on the strength of the efficient action of the safety valves. But some fine day the valve has got a hitch, it *won't* work, and there is a blow up!

P.—What circumstances affect the length of interval between each meal?

Dr.—The amount of the food ingested, the amount of waste of tissues, or of exercise undergone, experienced in the rapidity of

the vital actions, and the coldness of climate. On account of growth, children require food oftener than adults; and adults, on account of their activity, oftener than the aged. Where great cold is to be endured, great quantities of carbon and hydrogen are consumed in keeping up the animal heat, and therefore frequent proportionate supplies are necessary.

P.—What do you say of very frequent meals the four or five per diem of many people?

Dr.—I believe them very wrong—very unphysiological, and therefore very injurious. The more the stomach can be spared, the less frequently the *molimen digestivum* is called up, consistently with the due supply of reparative materials, the better for immediate health and comfort, *as well as ultimate longevity*. One bad effect of frequent meals, independent of the surplusage of nourishment they are apt to introduce, is the sluggishness, the disinclination to exercise they determine. Whether two or three meals per diem are better for any healthy individual, depends on peculiarities of the circumstances or of the constitution. But make it an invariable rule to eat at fixed periods, eat regularly. Breakfast should always be *earned* by some exercise or other, unless in the case of weakly children, confirmed invalids, or travellers commencing a journey early. A comfortable breakfast, whose digestion is well ensured, is a good beginning of the whole day, a foundation for its labour, a means to the success of its plans. Luncheon, so called, *is* dinner (or should be), at an interval of five hours after breakfast, followed by supper (dinner fashionably), at an interval of either five or six hours. This ensures generally an empty stomach before each meal. But with those whose breakfast is so copious, or whose digestion is so slow, that breakfast is not disposed of evidently at the end of six hours, then two meals per diem must suffice for them, if they are wise. The last meal for those who take three meals, should be at least three hours before bedtime—the dinner of those who take two meals, should leave four or five clear hours, *at least*, for its digestion, before going to bed.

CONVERSATION FORTY-EIGHTH.

The proper food of man—"Vegetarianism"—No universal or exclusive diet as he is at present constituted—The lapse of condition, of time, and the force of circumstances have modified man's alimentary apparatus as it has altered his features, colour, and outward conformation—Man's original *dietetic adaptation not questioned, but no longer applicable to the question—"What relations* now *exist between the qualities of man's food and his digestive capabilities?"—Is a* mixed *diet, or a purely* vegetarian *diet* now *the most appropriate?*—Proper *food a question of the proportions of its ingredients, according as heat-forming, water-forming, or tissue-forming materials are in principal demand, to repair the waste and supply the wants of the body—Is it sensuality, or reason, or instinct, that leads him to unite in his diet the substances of the vegetable and animal kingdoms?*

PATIENT.—I QUITE believe that man's physical organisation, his moral dispositions, and his mental powers, are intimately influenced by the food he eats. The vegetarians hint, if they do not assert broadly, that all this influence is for *good* on their side, and for *bad* on the side of those who use animal food as a portion of their diet.

DOCTOR.—This is a mistake, however, of the vegetarians. I have had ample opportunity afforded me of forming an experienced judgment in the matter. Some time ago I had the worthy President of the Vegetarian Society under my care; a gentleman, whose life, talents, and affluent means, are devoted to works of benevolence. His family, also, and many of the Society, of the highest and lowest orders, have been my patients—and the conclusion I have come to, is this, that the *good* or the *bad* depends on the *quantity* and quality of such food as is used, whether it be purely vegetarian or mixed. Moderate quantities of well apportioned mixed diet, suited to the kind of life, climate, constitution, &c., will produce all the happy effects on mind and body that it is possible for any combination of vegetables, fruits, and farinaceæ to effect. We see an instance of this in COUNT CORNARO, whose diet consisted of fourteen ounces of solid food, composed of the flesh of animals, soups, eggs, and bread, with fourteen ounces of wine. I should tell you *en passant*, that Count Cornaro, at the age of forty, or thereabouts, was in so deplorable a state of health,

that his life was despaired of by his friends, and medical attendants. In this dilemma he commenced and *persevered* in a better system of management of his own. He lived in consequence over the age of 105, and then died, or rather seemed to doze off for good, sitting in his arm-chair by the fire-side—having blessed his *great* grand-children. Few men, if any, ever enjoyed such health and happiness during the last half century of so long a span of existence, as did this highly estimable and amiable man. You should read his life. When you go to Venice, you will see a fine portrait of him by Titian, when he was in his 105th year. Many times and oft have I looked on the face with admiration. You will not fail to observe the large *benevolence* and *firmness*, and the smallness of the lower organs of destructiveness, combativeness, &c. To return from this long digression, you will perceive that in the case of Cornaro, there was an entire exclusion of fruits and vegetables; but their elements, the acids, salts, alkalies, and earths, the latter contain, were made up in the constituents of his wine. His wine was the juice of the grape, mind you, not port and sherry. In fact, wine, or *tea*, or coffee, by a true instinct of mankind, are indispensable associates of animal food, *where green food is absent;* and this, because they contain those fine acids, salts, and inorganic constituents found in garden-produce, which of course the masses in large communities, who have not gardens, only eat sparingly of.

P.—Tea (or coffee), then, is an equivalent to wine, or a substitute for it? This is a new idea to me.

Dr.—Both for its exhilarating effects on the frame and for the *quality* it imparts to our food, which the developed nervous system of man makes far more desirable than *quantity; also* for those minute but necessary constituents referred to, tea and coffee exactly *replace wine*, are the *wine* of the masses everywhere in modern times, where wine does not abound.

P.—Well, I am curious to hear what you have to say of vegetarianism?

Dr.—There is much truth in it, most assuredly, *up to a given point*, and within proper limits, and in proper cases. It is a valuable, or rather *an invaluable curative agency*, in the hands of a judicious medical practitioner, in certain forms and phases of chronic disease. But, let me observe, it has a great leaven of error mixed with its truth. It is a good thing much abused. There is much zeal without knowledge in its prevailing advocacy,

and much gratuitous injury inflicted by its indiscriminate adoption. In fact, so far as I have seen vegetarianism, as practised by all classes of its partizans, the *right use* of it is the exception, the *abuse* is the rule; the rich err by excess in one direction, the poor vegetarians by excess in an opposite direction, both equally failing to hit that *juste milieu* of *proportions and ingredients*, wherein lies the whole secret and virtue of a *sound physiological diet.*

P.—You impugn, then, the doctrine of the general expediency and applicability of vegetarianism?

Dr.—Decidedly, in man's existing relations to the earth and the sky, and constituted as society now is. Indeed as a general system of diet recommended indiscriminately for the toiling, struggling masses of the 19th century, vegetarianism is a grand fallacy, an unfortunate delusion.

P.—The vegetarians object to animal food, that it is a stimulating diet. How far is this well-founded?

Dr.—It has no foundation but in the *abuse* of animal food. This objection as much applies to vegetable food. For pray what constitutes a *stimulant food?* That which is taken in proportions and quantities beyond the wants of the economy at the time. A hearty breakfast of tea, bread, and beef-steaks, would be highly stimulant to a man just risen from bed, and who had had little or no exercise for several days. But if the same man had been walking thirty or forty miles per day for a week, or had been at hard work for four or five hours previously, then the breakfast in question would not prove at all stimulating; for in that case it would be in relation to the wants of his organism, and contain the fitting materials of its repair.

P.—I see now clearly, for the first time, what constitutes a stimulant diet—that is, a diet which proves to be injuriously or morbidly stimulant—in short, that which contains an excess of materials which the system cannot duly dispose of, and which, therefore, must be a load and an oppression to nature.

Dr.—Yes; animal food, or even bread, and peas, and beans, being highly azotised, largely contain the elements of corporeal repair, and are, therefore, only proper in any considerable quantities, where great corporeal waste has taken place, and where the reparative powers are not interfered with by disease or exhaustion. It is for this reason that the diluted form in which nitrogen exists in fruits, roots, and farinaceæ is more appropriate for genial climes where the labour is moderate, or the life indolent, but where the

perspiration is profuse. In such circumstances little respiratory element is wanted, therefore, the portion of it that enters into the diet, is simply for maintaining the due lubricity of the tissues, and for its other structural uses, but it is not wanted as fuel. The comparatively slight corporeal waste, is amply repaired by the small proportion of nitrogen in these substances, but the excessive waste of watery fluids or perspiration, is compensated in the largely starchy element that forms the bulk of their food. The starch (a hydrate of carbon) is resolved into water; the carbon that remains is either eliminated without being burnt, as by the liver, lungs, or skin, or it can be appropriated to respiratory uses, if need be. The starch of the potatoe-feeding Irishman is so got quit of, in the former way, in the broiling dog days; in cold weather it is burnt as fuel to keep him warm. In like manner, rich oily food (or respiratory material) taken under circumstances where there exist no means of burning it off, as in warm rooms or climates, is highly stimulant and injurious; but not so under due exposure to cold.

P.—According to your definition of stimulating food, the vegetarians I have seen, err quite as much as the animal food eaters; they not only err in eating excessive quantities of food such as it is, but in the abundance of butter, oils, sugar, and seasonings with which it is made palateable. Some of your friends, who adopt Cornaro's allowance of good mixed food, act more sanely (it seems to me) and more physiologically than many vegetarians I have known, whose daily dose is nearer 3lbs. of bread and vegetables—and this independent of three or four eggs, which some of them eat daily, and which is quite equivalent to two good mutton chops.

Dr.—The vegetarians entirely mistake the principles of scientific regimen, which consists *in proportioning the ingredients of the food to the wants of the body, according to the quantity and quality of the reparative materials needed.*

P.—I see not, therefore, what advantages vegetarianism possesses, in this respect, over a well-selected mixed diet.

Dr.—On the contrary, a mixed diet possesses great advantages in the facility with which it introduces a small bulk, a highly nitrogenised element, to qualify to the hard working man, or to the exhausted convalescent, the excess of non-azotised constituents in his bread, potatoes, green vegetables, fruit, beers, &c.

P.—It results clearly from what you say, that the vegetarians, in

laying so much stress upon the *origin* of their food, its coming from the *vegetable* kingdom, rather than the *animal*, are arguing wide of the mark, in fact, place the question entirely on false grounds—grounds that should never have been raised. For after all, what is the real and pertinent question to be discussed ?—the diet most suitable for human health, happiness, and longevity. Now it is evident as the sunshine of day, that no considerations touching simply the source of this food, will settle this question. But an exclusive reference must be made to its *relative composition*, and to the suitability of the ingredients of the food to meet the specific wants of the body, for the time being. And these wants are infinitely modified and varied by circumstances. Food, you will recollect, is for the purpose of supplying the waste. 1st. Of the solid structures of the mechanism. 2nd. Of the water required for the sound condition of the tissues and for the performance of the vital functions. And 3rdly. Of the animal heat. For these the nitrogenised and non-nitrogenised elements of the foods are demanded in very varying proportions. Under severe labour the albuminous element is the prime requirement for the repair of the tissues disintegrated. Under no exertion, but with exposure to intense cold, the fatty or oily element is almost alone in demand; with great fatigue and great cold both to sustain, then a diet, equally rich in fibrine and in fat, is that which is desirable. In a burning clime, and with an indolent life, a diet deficient in fat and fibrine, but abounding in starch, sugar, acids, &c., is that which is most proper.

P.—So that he who asks what is the best food of man is like the innocent traveller, who asked the sailor which was the most favourable wind for a ship, without reference to its *destination*. It is thus precisely with the diet question, it would appear.

Dr.—The best and most appropriate diet is entirely a question of circumstances, of *the destination of the food;* of the object for which it is given; the specific purposes it has to accomplish in the organism, and the substantial waste it has to supply.

P.—This, then, I may put down as safe ground to argue on—that it is in *the due proportion of its constituents*, according to the varying requirements of circumstances, wherein consist the virtue and the value of any dietetic scale, and its suitability for maintaining the physical and mental powers in their state of highest healthy energy. Pure fat or blubber is thus the instinctive craving of the frozen, indolent, Esquimaux; flesh and fat, or oily maize

bread the requirement of the active "voyageur" in the same regions; and fruits and farinaceæ for the warm south; and all intermixtures, I presume, of vegetable and animal diet, for the intermediate latitudes?

Dr.—The degrees of latitude, indeed, form a sort of diet scale. Beginning at the torrid tone, we have their delicious fruits, the staple support of the natives, as they were, no doubt, of primitive, unsophisticated man in the same luxurious climates. In the temperate zone, the farinaceous grains and roots become a predominant element of the diet. By degrees ascending, as the sky becomes less cheering, and the soil less prolific, the devices of art become more and more in demand, to aid the backwardness of nature, or to compensate her defects. Here man seems truly omniverous, his dishes culled equally and advantageously, too, from the animal and the vegetable kingdoms. As we get into the sterner hyperborean regions, the animal element in the diet increases, and the vegetable element diminishes, till, at the extreme north, we find man entirely *carnivorous*.

P.—It may be safely affirmed, then, that the experience of every climate has determined the diet best calculated for promoting the health, happiness, and longevity of its inhabitants? This diet, varying as it does in almost every country and region of the globe, makes it very evident that no single or exclusive code of diet can become universal, at least constituted as human nature at present is, and constituted as are the elements of outward nature in the midst of which man wends his way, as best he can, through the toils and troubles, the sunshine and pleasures of this mortal life.

Dr.—A universal diet will do for a universal climate, and for a universal condition of mankind. If all climates and all conditions were equalised, then it might be propounded.

P.—It seems to be about as sound a project to propose a universal *size* and *cut* of hat and coat for all heads and all backs.

Dr.—The fly in the vegetarian pot of ointment, the vice that vitiates all their reasonings, the assumption that nullifies all their arguments, is this:—they talk as if the earth were still a paradise, or going to be very shortly, and that one eternal sunshine was the order of the day; that the sky was always cheering, the soil everywhere propitious—that man was still in a state of the sweetest primeval innocence—*that his organism had undergone no alterations by the lapse of his condition and the diffusion of the race—that his digestive apparatus especially had remained unmodified by all*

the varieties and incongruities of diet to which it has been subjected for Heaven knows how much above six thousand years. But nothing is more evident, nothing is more clear to common sense, than that those climatorial and dietetic influences, which have so profoundly altered man's natural conformation and colour, as we observe in the various tribes, have impressed as profound modifications on that grand interior canal and thoroughfare, whose delicate apparatus is destined every day to be brought into rude collision with the infinite and multiform substances, whence he extracts and elaborates the materials that replace the daily waste and wear of his body.

P.—*Till it returns to the dust whence it sprung, and his spirit goes back to God who gave it.*

CONVERSATION FORTY-NINTH.

The question of Vegetarian Diet continued.

PATIENT.—THE conclusion which we evidently reached in our last conversation, was that, *admitting* the original food of man to be, as it was unquestionably, the spontaneous productions of the earth, yet that *that* had nothing to do with the grand practical question, "What is the best food of man?" as we now find him, in very different circumstances, a denizen of every clime and a workman of all work; with a body altered, vitiated, denaturalised, by the voluntary or enforced departures of ancestry from the primitive constitution of things—and this in an increasing ratio, from age to age, through the long stream of times.

DOCTOR.—We know for a fact, that animal organisms are immensely modified by the manner of feeding them. Granting that the appetite for flesh was not natural and original, and native born, still, after it was once acquired and cultivated, it would, in the course of generations profoundly alter the structure, and modify the actions of the digestive apparatus. So that, like an artificial socket formed by a dislocated bone, was at first unnatural, has now become entirely natural—has, in fact, perfectly substituted and superseded the original provision of nature.

It is very evident, then, since the circumstances of man's original dietetic adaptation no longer exist, that his original food is no longer available, is no longer pertinent to the question; the circumstances that herbs, and fruits, and roots, sufficed for primitive man in the primitive perfection of his organism, and in the happiest circumstances of external nature, is no longer a criterion of what is fitting in the degenerate, unnatural condition of the masses of mankind at the present day. In fact, far too much has been made of the question of the original dietetic adaptation. It should never have been invoked in the controversy.

P.—Yes. The diet best for man in a state of pure nature—for we can only argue of similar adaptations in similar circumstances, or the Divine appointment for Adam in paradise, who had nothing to do but enjoy himself, can only, by a great stretch or the blind zeal of partizanship, be presumed to be applicable now. If man is to eat the fruits of paradise, he must surely lead its life, and enjoy its clime.

Dr.—I admit that isolated individuals here and there, favourably circumstanced for the experiment, and with resolution to accomplish it, to show to the world the resolution they have in adhering to an opinion or practice, can educate or accommodate themselves to man's primeval diet. And so far as *taste* is concerned there is no hardship at all in doing this. But so long as the earth and the atmosphere continue what they are, and man's relations to both continue what they are, to imagine "a return to nature," in this way, is visionary and romantic in the extreme, a mere affair of sentiment.

P.—If we are to go to the early ages of man for their food, and to adapt it to the highly artificial state of modern society, I see not why, by the same mode of argumentation, we should not also borrow their simple raiment, habitations, manners, language, arts, and institutions, *which all perfectly served their ends with them —which were appropriate to their condition.*

Dr.—With as good reason, I think, the one as the other.

P.—But do you not think the *cruelty objection* of the vegetarians may be entertained? the cruelty implied in the slaughter of innocent animals, that the Creator could not have rendered necessary food thus obtained by violence to the best sympathies and instincts of a refined human breast? Is not this more difficult to dispose of?

Dr.—Not at all. There are two modes of viewing that question.

We differ from the view of our morbidly sensitive, perhaps, or *sentimental* vegetarian friends.

P.—Perhaps you have the organs of destructiveness well developed in your head?

Dr.—Phrenologists say only so-so; and certainly we should yield to no man in compassion to the brute creation in circumstances demanding its exercise.

I think this cruelty argument untenable ground. We see in the present condition of the creation one animal preying upon another, throughout all the grades of being. This sight certainly at first stirs hard thoughts within us, but the arrangement is not so cruel as it appears. However we may attempt to solve the difficulty, we must accept the fact, *as an ordinance of the Creator. Man in his dietetic instincts, habits, and capacities, forms no exception to this appointed state of things.*

P.—I suppose, then, you establish it as a law, *that the higher animal has a right or privilege to live on the lower, or to kill them if a nuisance?*

Dr.—In the present constitution of the world, and in its present *providential* administration, I think no law is clearer. It is in consequence of this law that man takes the lives of the inferior animals whenever it suits his health or his convenience. Whatever the vegetarians may say about the Divine "permissions" and "commands," the *sanction* of Deity it everywhere given, in the book of Revelation as well as in the book of Nature, to the use of animal food. Nowhere in the former is even a hint thrown out of the injurious action of flesh on the human system. In the Jewish code, where almost every minutiæ of life was provided for, the fitness of the diet is never questioned, save that the clean animals are discriminated from the unclean. It stands on the record how largely flesh entered into the diet of men (the Levites) who behoved to be examples of holiness to the people, in consequence of their very function. If the effects of this diet were of the brutalising nature alleged by the vegetarians, undoubtedly it would have been strictly forbidden to the priests, at least. Again, in the early Christian church, when the eating of meat offered in sacrifice was discussed, the *principle* of eating flesh itself is never once called in question, its disuse is not even advised as a matter of expediency.

P.—But be pleased to recollect that Scripture was not intended to offer us a code of dietetics.

Dr.—Of course not. But Scripture is always consistent with itself. From many *actions* recorded there we learn *principles.* We have the case of Elijah fed miraculously on bread and *flesh* brought him by a raven. Now if bread sufficed for the due sustenance of the body, why was an unnecessary and injurious aliment added to it? This is contrary to the Divine procedure in all other matters, where we never see two agencies concerned in an action, if one will accomplish it. We find our Lord himself setting an example of eating animal food, *boiled fish and honeycomb.* And this, by the way, is the way honey should be eaten. The wax is not only a valuable excrementitious element, but a provisional *respiratory material,* if the body *requires* to use it.

P.—One would think, then, that had there been aught innately inimical to the human organism, in animal food, as the vegetarians assume, then we should have *tacitly* at least learned the expediency of renouncing it, from finding no sanction to it?

Dr.—But, in fact, we find the sanctions of Scripture *all* on its side, save in the case of the *Jewish boys* in Babylon, who fattened on pulse. But there is no contradiction in this supposed counter fact. If they had fattened on fruits and roots, we might have been posed with a difficulty. But this diet is so highly albuminous, so rich in nitrogen, that it may well be called *vegetable flesh.*

P.—Well, to leave Scripture, which I think the vegetarians would have done more wisely to have let alone than to have invoked in the controversy, and to come to their arguments deduced from anatomy and physiology. The vegetarians are very strong here, I believe?

Dr.—I do not think so. The character of the digestive organs reads only a very enigmatical lesson as to the sort of food best adapted to them. Comparative anatomy is equally far from being clear in its indications on this head.

It is a grand and fundamental error of the vegetarians to assert that the human alimentary apparatus is *intermediate* in its characteristics between the flesh-eating and vegetable-feeding animals. Nothing is further from the truth than this. Neither man's jaws, teeth, stomach, nor bowels, have exact affinities with those of any other animal, further than that common resemblance, or *general* identity of apparatus, which we should expect to find where identical objects are to be accomplished. The human masticatory and digestive organs are widely different in character from those of all the brutes beneath, even from the ape's, which stands next in rank

to him in the zoological scale. The human organs have no exact points of affinity with those of the brutes. They are of a character altogether *sui generis*. They constitute a *tertium quid* economy entirely, and indicates a *tertium quid* adaptation as regards diet that has no analogue in the brutes. What this *tertium quid* adaptation is, is the great matter in dispute. Herein precisely lies the difficulty of settling the question.

The prevailing opinion of naturalists is that this indicates man's *omnivorous* character. Now this is faulty. We hardly know what *omnivorous* means as applied to man. The hog is omnivorous, and ducks and geese are. But man, the most savage, does not eat anything and everything. On the contrary, man—to take a fair specimen of him—is remarkably "*eclectic*," and the more so, the more refined he is. The vegetarians, repudiating the omnivorous inference, contend that the supposed *intermediate* character of the human alimentary organs fit man for the digestion of substances *intermediate* in chemical composition and mechanical cohesion between the food of the *carnivora* on the one hand, and the food of the *herbivora* on the other, viz., fruits, roots, and farinaceæ. It must be admitted that there is something very ingenious in this, something very vrai*semblable*.

This view has much plausibility I admit, and much truth in it. Such vegetarian diet was no doubt most congenial to man's constitution in his state of primitive innocence, and perhaps is so still in a genial clime, and under happy circumstances. But this category of *intermediate* substances is very elastic, and will stretch so as to embrace a much wider range of substances than the vegetarians are pleased to include in it.

P.—But there is a wide chasm often between the *vrai* and the *vraisemblable*.

Dr.—So it is in this case, I believe. The monkey tribe are known to be feeders of this *intermediate* character, and in them, therefore, the vegetarian advocates have sought for the *type* of a true vegetarian masticatory and digestive apparatus. Now their logic is, man's masticatory and digestive organs come *nearer* to this type than to the alimentary conformation of any other animal; *ergo*, the natural dietetic adaptation of man is to fruits, roots, and farinaceæ. These are precisely their premises, and their conclusions, without any straining or perversion.

Now, I contend, in opposition to the vegetarian mode of viewing the subject, that the resemblances in question are only such as

were naturally to be expected in the class standing at the top of the zoological scale, *but one remove from man.* In the structure and use of his upper and lower extremities, as well as in other points, the *oran outan* comes as near man as in the conformation of his face, jaws, teeth, and stomach. But there are still vast points of difference. The faces and figures of Venus and Apollo, do not more differ from their hideous caricature, the monkey's, than do the human alimentary apparatus from that of this highest of brutes. The ape's large temporal zygoma and muscles, his defective parotid, and sublingual and submaxillary glands; his prominent, pointed, and separated teeth; and the absence of semilunar folds in the intestines—what do we infer from these characteristics? These unequivocally denote how large a dash of the *carnivorous* propensity and adaptation are infused into the monkey.

P.—How, then, in the name of common sense, is the monkey's alimentary apparatus adduced to teach us that man is a *frugivorous* animal? Anatomy aside, we know, in point of fact, that monkeys in their wild as well as in their tame state are exceedingly fond of eggs and young birds.

Dr.—The vegetarian conclusion is an evident fallacy, not to say absurdity. It is totally unjustifiable. Sound logic and sound analogy are all against it. The monkey's alimentary organs are as plainly of a *composite* character as are those of man. Like man, he has an adaptation to vegetables and to *flesh;* but, inasmuch as he was intended to eat *his* flesh RAW, nature has plainly furnished him (as was requisite) with more decided and *trenchant* carnivorous apparatus than man, who was intended to eat *his* flesh COOKED, and to *cut it up with knives and forks* to boot.

P.—Now I see your drift. This now places the matter before me in a new point of view.

Dr.—It would have been very strange, indeed, if man, with the Divine gift of *reason,* with his contriving head, and executing hand, had been fitted with the *mangling, tearing, devouring* contrivances of the CARNIVORA. There is nothing of supererogation in the works of nature. The spider who can weave a web to entrap his prey is not furnished with wings to bounce at the poor fly in its own aërial element; *he wisely holds on by his cord.* The porcupine's or hedghog's bristles are a sufficient defence from its pursuers: it needs not the superaddition of the stink-bag of the skunk to say to its enemy, "Hands off!" So superfluous would it have been in nature to have armed man for the appropriation of

the fleshly element of his diet with the apparatus of animals who have usually to fight tooth and claw for every meal, and who eat the flesh they consume mangled and *quivering with the life in it.*

P.—I see it all plainly. *The organs of all animals are constituted with exact reference to their wants.* It is *no pooof at all*, that man is in no degree carnivorous, because he is not furnished with the characteristic apparatus of carnivorous brutes. He needed it not. His reason is to arm him with instruments of art to supersede the weapons of nature. The endowments of his hand and his head are more than an equivalent for any loss of predatory organs.

Well, I perceive you are gradually working your way to a solution of the puzzle: the discovery of the unknown element we are in search of, this *tertium quid*, or quartam quid dietetic adaptation of man.

Dr.—What is it but *cooked food*, whether animal or vegetable? Granting all that the vegetarians contend for, that man's alimentary organs are of the intermediate character alleged, and that their inference is the true one, that his natural digestive adaptation is to an *intermediate* class of substances, we claim for cooked food, by the justest title, a place in this intermediate class. For such is the modifying effect of culinary processes, that food so subjected, whether animal or vegetable, can scarcely be said to be analogous then to anything in either kingdom. Roast beef and plum-pudding, bread and porridge, boiled potatoes, macaroni or rice, omelettes, fritters, and pasties, have very slight claims of affinity with anything provided by nature for the diet of pure carnivorous, herbivorous, or granivorous animals.

P.—Certainly this looks very like the *tertium quid* diet. We should expect the teeth and stomach appropriated to this diet, to differ totally from anything presented by animals who have to eat their food *neat* and *au naturel.*

Dr.—And it does so differ. It is quite a fallacy to compare man in his alimentary apparatus and capabilities with any of the brutes beneath. Even in these points he stands at an equal remove from them all, herbivorus, granivorous, carnivorous. In these points he is as distinct from them as in his lofty parts, his *os sublime*, his exterior conformation, internal structure and natural endowments. He stands altogether, and in all respects on a proud pinnacle of isolated pre-eminence, far beyond the reach of all competition or comparison with beings separated from him by an

infinite chasm, a chasm never to be bridged over. It is a mistake altogether to invoke comparative anatomy, to the settlement of the question what should be the proper food of man. The whole argument is to be repudiated. It teaches positively nothing. Man's alimentary economy is entirely distinct, and *sui generis—a tertium quid* or *quartum quid,* without precise analogue in the structure of his brute fellow creatures.

The grand error of the reasoning of the vegetarians, is the assumption of the alternative *uncooked food.* They argue as if man *must needs* eat *raw* flesh like beasts, raw herbs like cattle, or raw roots and fruits like monkeys.

Man is pre-eminently *a cooking animal.* His cooking powers and propensities are an exact measure of his degree of civilisation. It is in fact, in consequence of his culinary art that he is enabled to draw his nourishment indiscriminately, and in all proportions from both kingdoms of nature, imparting to them a constitution and a consistency in correspondence with his organisation and his wants, and conformable to his tastes and instincts, and fitted to every varying demand and power of assimilation. Food so modified cannot be fairly compared with the natural nourishment of any of the lower animals. All argument, therefore, based on this false analogy and comparison falls to the ground, is good for nothing.

But I contend, that if comparative anatomy is to be held as having a voice in the question, or contributing any light to its settlement, that it does not favour the vegetarian views, that a well apportioned, well cooked *composite* diet, according to the experience of the masses of mankind, best accord with the *specific* nature of man's digestive organs, and best sustain health and strength.

P.—If man, then, were not *at first* constituted as by his alimentary organs we now find him, I conclude, that the Creator in bringing man out of paradise to seek his food in the wide wilderness of the world, so modified his organism, as to be prospectively fitted for the altered circumstances in which he was placed, for the climates he was destined to spread himself to, and the food the necessities of his nature would compel him to eat.

Dr.—It is very likely, but whether it be so or not, the course of time and of events would imprint on his organism those modifications pointed out by his adaptations and his instincts.

P.—Your conclusion, then, of the whole matter is, that there are no anatomical grounds for inferring that the human organism is especially adapted for fruits, roots, and farinaceæ ?

Dr.—On the contrary, man is constituted to live indifferently on the products of either the vegetable or the animal kingdom, always provided they are put in the best shape for reduction by the stomach, and taken in such measure and mixture as will ensure the due relative proportions of the constituents of the body.

P.—I may lay it down then as a clear proposition that, modified as the human organism has been by the lapse of ages, whatever may have been its original adaptation, it is now formed for deriving its support neither from flesh nor vegetables exclusively.

Dr.—Yes, man finds both in animal and vegetable products all the materials of his organism, the nutritive principles you will be pleased to recollect, are identical in the animal and in the vegetable. The albumen of the grape, of wheat, of egg, and of muscle, does not differ. A diet of fruits and farinaceæ undoubtedly contain all the elements of the human body, therefore they are quite adequate for nourishment, perfectly adequate for some circumstances, but very imperfectly for others, this depending on differences of constitution.

CONVERSATION FIFTIETH.

Soups and Broths.

Patient.—I suppose soups and broths present the justest title to be ranked in the category of liquid aliments?

Doctor.—They do: yet I believe their exact nutrient virtue and efficacy are very much overrated, at least the *conditions* of their nutrient power are not well understood by the generality of people. Liebig has well hit it off in calling soup *the medicine of the convalescent.* It is also the cordial of the man too feeble or too exhausted to eat solid food till his energies rally; and it serves admirably to obtund and moderate the appetite of the excessively hungry; who would otherwise be inclined to *gorge* injuriously. It operates upon the exhausted system like the transfusion of so much blood into the veins. It is a vivifier and restorer *par excellence:* it summons up appetite: it rouses the dormant energies of the digestive organs; and while it creates a glow in the vital

centres, it diffuses warmth to the extremities, and recalls colour to the cheeks. In fact, soup is best of all *tipples* in its way, and might well replace much of the wine, spirit, and malt liquor, yea even the tea and coffee tipples, that are taken in similar circumstances.

P.—In looking upon soups and broths, then, in the light of a *tipple*, a temporary stimulant, you do not regard them as available sources of permanent strength?

Dr.—I do not: that is if taken alone without other solid food. I limit their appropriate use to two classes of people: 1st, invalids and convalescents, whose exhausted frames require materials of constant sustentation (so far as it can be received without exciting and oppressing them), but whose digestive and other powers are so far enfeebled by disease, as to be unable to digest supplies in quantity and quality at all commensurate with the necessities of the case. The 2nd class comprises those persons who have excessive and morbid appetites. Soup in this case, by distending the stomach and soothing the cravings of appetite, prevents it from satisfying itself on solid reparative materials, that much exceed the wants of the body. In this view, I have no doubt soup is often used as a piece of household economy, the soup replacing pudding, and sometimes being more conveniently made.

P.—A fact that strongly corroborates your view, that soup is only a temporary restorative or a *filler-up*, is this, that of *trainers* for the "ring," or for pedestrian feats, never using soup to get up the strength of men;—a diet which experience would no doubt have suggested, if such were really its effect. To me, the non-use of such a diet in such cases is a pretty certain proof, that for men in health it does not answer the end of getting up, or keeping up the strength.

Dr.—Enduring strength is only derived from solid organised substances, as meat and vegetables, *as nearly as possible in the state of the natural aggregation of their particles.* All decompositions, or derangements of the primitive constitution of food, by withdrawing some of its elements (as the bran from wheat), impairs its nutritive value. A *chemical compound* may be made containing all the elements of bread or beef, but it will fail to nourish, because it is a *chemical product* and not a provision of nature. No more will single, or uncombined alimentary principles suffice for nutrition. The only exception to this, is the case of dogs being nourished on *gluten*. Soup, I take it, is a nearly

parallel case to that of decompounded or isolated. I conceive the condition of the elements of meat or vegetables when extracted by boiling to be almost as unnatural, as subversive of the intents of nature, as inadequate to her ends, in short, as little permanently nutritive. Let any strong man try to live on soups for a few days, even with the addition of a small quantity of bread, he would feel the necessity of eating every two hours, and of being inconveniently *blown-up* into the bargain. Without bread, after a few meals, his soup, even the best, would cloy, and soon become absolutely disgusting.

P.—But I suppose soups are, like other things, good and bad; there are great varieties of soups, and of their powers of nutrition?

Dr.—Unfortunately the soup most generally used, most popular, most prized, is the worst, that abounding in *gelatine;* this is a thing proved now to be a grand dietetic deception, a thing absolutely without any nutritive value, a thing tasteless in itself, and when eaten exciting nausea, a thing that, in reality, so far from increasing, diminishes the nutritive value of the substances with which it is eaten. Gelatine soup is in fact a source of disease. It loads the vessels with nitrogenous products of which there are no means of disposing, products which can administer neither to the formation of structure, or the function of respiration.

The general object in soup-making was to make it *gelatinous*, from the false impression, that in *that* lay the strength and virtue of good soup. By long boiling of flesh, the cellular tissue of the muscular fibres yielded gelatine. But it was soon found that bones, gristle, and tendons, horn feet, &c., all cheaper materials too, yielded more and better gelatine. So that the chemical or culinary product came at length to replace the genuine meat soup. However, repeated experiments in hospitals proved the fallacy of considering gelatine as a nutrient article. Turtle soup, "mock" as well as genuine, is as great a nutritive fallacy as any of the others of this class; I believe in my conscience a source of no small amount of disease.

P.—Will you describe then what you consider really nutritive soup, and how made?

Dr.—Really good soup is that which is a simple infusion of flesh, in which all the active ingredients of the latter are oozed out, the *juice of flesh* virtually, the soluble matters of the whole muscular tissue, the salts, &c., in short, the inorganic as well as the organic constituents of muscle, or, as you would say, "the lean"

of meat. In this case the exhausted fibre of the muscle is of little nutritive value *per se*. But in nature's own combination, it is even more than the bran is to the grain. As a mere *filler-up*, or for excrementitious purposes, to impart the due distension of the muscular coats of the intestinal canal, which is a prime condition of its healthy action, it is indispensable. If you inquire, you will find how many there are who are never so well as when they eat freely every day of what the French call *bouilli*, or in other words, beef all but boiled to rags; the truth is, that the majority of people not only err in the quantity they eat, but err as well in loading the stomach with matter in itself *too nutritious*. This is one of the most approved means I know of developing a host of ailments, and curtailing the span of mortal existence; of animal food, in the state I have mentioned, more can be eaten with impunity; and in time, with its vegetable accompaniments, it becomes a favourite dish, and very salutary and easy of digestion. Invalids with weak or heated stomachs would often do well to rest satisfied with this, and eat no more animal food at their dinner.

P.—This shows to me more and more plainly how foolish it is to over-refine and *concentrate* foods, by man's sophistications to separate God's combinations. You show the utility, the advantage, the necessity of both the juice of flesh and its exhausted fibres in the nutrient process, why not leave them, then, alone as the Creator made them—why not cook the meat in any wholesome way, as by roasting, that does not separate elements so essential to sound digestion and perfect nutrition?

Dr.—The only cases that justify this denaturalisation of food is that of invalids, whose digestive powers are inadequate to anything but the mere absorption of fluid, and that of those persons wherein the same absorption will most safely allay the cravings of a voracious appetite, or *mild* solids as mentioned above.

P.—You then explode the whole subject of soups, at least as nourishment for the healthy man. Soup, you argue (if I take you up rightly), is an isolation and concentration of the nutrient principles of meat, is an entire breaking up and denaturalisation of the original proportions and arrangements of the organised structure, the injurious separation of what nature has joined, the juice from the husk or its vehicle, and often the production of new matters. If you take food thus altered, thus denaturalised, it cannot but be heavy and unsuitable, especially if taken in any quantity adequate for the meal of a strong man. If you take the soup

alone, you receive the tipple of an invalid, you take that which affords only temporary nourishment; if you eat the fibre alone, from which it has been extracted, you take what yields but a small modicum of nourishment with more bulk, filling up without heating and stimulating so much. But if you eat the flesh cooked in the plainest way, you receive the most thorough and complete nourishment when called for and advisable. But it strikes me there is a case wherein you would allow a bowl of soup to a strong man, that is, when the interval between breakfast and dinner is too long for a comfortable fast, and when a solid luncheon would spoil dinner or disable for the afternoon's work.

DR.—I allow such a case; but still it may be ranked in my *second* category—soup taken as a filler-up; for it is to prevent excessive appetite and famishing feeling. If *support* be the object, a little fruit, or a biscuit, or a few potatoes, or other vegetables, will be quite as *light* to the feeling, more healthfully exercise the stomach, and send perhaps a more grateful as well as more available tribute to the blood. Under ordinary circumstances, I would reserve soup as a mere lubricating and grateful introduction to dinner, when only a small quantity is taken for this purpose.

P.—Well, will you proceed with the making? how would you extract the best soup from meat?

DR.—To obtain the best flavoured and strongest soup, the flesh is chopped finely, and slowly heated to boiling, with its weight of water. It is kept boiling for a few minutes, and then strained, and pressed. This is, in fact, our beef tea. Additional boiling may extract additional organic matter; but it is at the risk of spoiling the flavour, and perhaps impairing the nutritive qualities of the soup.

P.—What is the composition of soup thus made?

DR.—It contains all the soluble principles of the meat; its fibrine, albumen, hæmatosin or colouring matter of the blood, fat and stearine, lactic acid, and inosinic acid, creatine, extractive matters, and numerous salts.

The constituents of the blood, I should here observe, are very different from those of the juice of flesh. The blood, therefore, must undergo a whole series of changes before it acquires the form and qualities adapted to the production of living muscle, before they become constituents of the juice of flesh. In eating the flesh, therefore, we eat something that is elaborated a

degree beyond blood, constituents of our structure prepared to hand.

P.—What is the scientific mode of boiling meat when the object is not to make soup of it?

Dr.—The object is then to retain all the juices of the meat, if possible; with that view the meat is put into the pot when the water is boiling briskly, and kept boiling for a few minutes. This coagulates on the surface, and to a certain depth inward, the albumen of the flesh, forming a sort of protecting skin, which prevents, on the one hand, the juice of the meat from flowing out, and on the other, prevents the water from penetrating into the interior. The pot is then to be placed on the hob at a temperature of about 160° to 165°, and allowed to simmer till done. In this way the flesh retains all its juices, and its aroma, and is thoroughly tender at the same time. In the attempt to extract more completely the meat by long boiling, I am strongly persuaded that we deteriorate our soup.

P.—What is the effect of the addition of vegetables to soup?

Dr.—Slightly to augment the proportion of azotised matters, but the sugar, the mucilaginous matters, and the salt they yield, slightly increase its density, and the volatile oil communicates its flavouring principles.

P.—What is the constitution of boiled meat?

Dr.—Fibrine, albumen (coagulated), gelatine, fat (elaine, stearine), nervous matter, phosphate of lime, and magnesia, &c. The fibrine is insoluble in boiling water. It hardens without yielding anything. The hæmatosin dissolves instantly in the water, colouring it red; it coagulates with the albumen, and forms the brown flocculi which float on the surface of the soup, its scum. The fatty matters also melt and float. The cellular tissue softens jellies and makes the flesh more pulpy.

P.—What, in conclusion, is your summary of soup?

Dr.—But too generally it is a method of wasting, spoiling, or robbing meat of its nutritive principles. It presents but a small proportion of nutritive and savoury principles. A quart of soup of the best quality contains only three quarters of an ounce of dry matter, one-third of which is saline substance. Extract of beef, by evaporating the decoction, is a brown elastic paste, soluble in water. One pound of lean beef yields one-third of an ounce. Beef loses fifteen per cent. by boiling. Mutton ten per cent., and fowl thirteen and a half per cent.

CONVERSATION FIFTY-FIRST.

Condiments or Seasonings.

PATIENT.—WILL you be so good as to explain your views of the nature and action of condiments, or the seasonings we take with our food, how far they are necessaries, how far luxuries, and how far they may be dispensed with?

DOCTOR.—Their virtue depends on their volatile oils, or their aromatic, sapid, and pungent principles; in the case of sugar and salt, they supply actual constituents of the secretions and excretions. They evidently promote the activity of digestion and assimilation, and often correct injurious qualities of the food with which they are taken. A condition that greatly promotes the due digestion of any article of food is that it be *relished.*

P.—Therefore that which increases the flavour of foods, while it gratifies the palate, promotes assimilation. This is not unnatural. I suppose, on the same principle, what is repugnant to taste, or smell, or sight, is found equally repugnant to the powers of the stomach, and fails to call forth the nutritive energies of the system?

DR.—It is exactly so. There is an intimate sympathy between the impressions of the organs of sight, smell, and taste, and the salivary and gastric secretions. This wonderful consent of action between related or dependent parts I have often had occasion to illustrate. The general physiological stimulation they excite is evidenced in increased secretion, circulation, and movements, and in the general feeling of comfort and satisfaction they diffuse over the economy.

P.—I suppose they contain few or no elements of nourishment in themselves?

DR.—Save salt, few contain any material constituents of the solids or fluids of the body; their action is chiefly *dynamic*, they excite the nervous power that presides over the acts of digestion and circulation. In the empty or passive state of the stomach, they irritate rather than produce any healthy secretory efforts; but in the full or active state of the stomach, they determine an evident increase of secretion. This is pre-eminently true of sugar, salt, pepper, spices.

P.—Do not some physiologists condemn the use of common salt?

Dr.—Only one that I have heard of; and he on very insufficient and untenable grounds. The universal relish for salt amounts to an *instinct*. It is, in fact, an essential of life, a true alimentary substance, as requisite to the composition of the structures as albumen, fibrine, sulphur, phosphorus, or lime. Even the austerities of the cloister never go to the length of excluding salt. Bread without salt proves a horrible punishment of criminals in Holland. The salt-licks of America prove how far the instincts of cattle prompt them to the use of salt. Salt furnishes the hydrochloric acid and the soda of our secretions and tissues, in which they are found free or combined with various bases. The alkaline constitution of the blood and bile depends upon the soda of the salt. According to Liebig, salt plays an important part in the phenomena of respiration; it converts into phosphate of soda a part of the phosphate of potash which exists in the blood, either directly introduced by the food, or by resorption from the tissues. Now, of all other salts, the phosphate of soda is the best fitted for the absorption and elimination of carbonic acid. A French writer, M. Mialhe, asserts that salt forms in the alimentary canal soluble compounds with certain dietetic substances, thereby facilitating the absorption of the latter. Its stimulation of the mucous and salivary secretions of the mouth are propagated to the stomach, whose capillary circulation, glandular secretions, and muscular movements, are all increased. By salt the process of digestion is rendered more active, and thereby a greater amount of nutritive materials are elaborated from the same quantity of food. In this way it is found to contribute to the fattening of cattle.

P.—What is the operation of vinegar and vegetable acids?

Dr.—In moderate dose they merely excite the mucous and glandular secretions. They provoke appetite, appease thirst, aid the solvent power of the gastric juice, and quicken the peristaltic movements. They materially facilitate the digestion of mucilaginous substances. Too concentrated, or in too great a dose, they impair or dry up the gastric secretions. Their abuse weakens the digestive organs, perverts their sensibility, and degrades nutrition. Hence the general emaciation they produce.

P.—What do you say of sugar as a condiment?

Dr.—It has become almost, if not altogether, as indispensable

a necessary of life as salt, and is as universally agreeable, although of savour quite opposite. As an element of respiration I have spoken of it before. As a condiment it excites the salivary and gastric secretions, facilitating digestion, furnishing an abundant chyle, and favouring the formation of fat, and of the biliary secretions.

P.—If sugar be so, butter, fat, and oily substances, are to be viewed in the light of condiments, as well as elements of respiration?

Dr.—They are truly so, and not the least agreeable of our seasonings either.

P.—From your discourse on the subject of tea and coffee, I may conceive something of the *modus operandi* of the *aromatic* condiments; they are *dynamic* agents, creators or exalters of power. They stimulate the nervous centres?

Dr.—Yes; and very materially the nervous extremities too. Pepper, or any spice, or volatile oil, however infinitesimal its proportion, cannot lie in contact with the mucous membrane without energetically stimulating at once its nerves, its blood-vessels, and its glands. Those that are contained in infusions, and that thus more largely admit of absorption into the circulating current, determine a more general excitement, both by their direct action on the nervous centres and on the coats of the vessels. It is in this way, that, received into the stomach, they produce marked reaction from the centre to the surface and extremities.

P.—The *modus operandi* of stimulants is then in a nutshell. I see it all. *This perceptible increase of vital movement, and the exhilaration of mind and body connected with this increased impulse given to the wheels of life,* is the whole secret of the popularity of *tipples* of all sorts, as you have described them. *They augment the cheering and pleasant consciousness of vitality, imparting, for the time being, speed and facility to all its processes, organic and animal.* It is mortal elysium—heaven on earth.

Dr.—You have it. That is the whole secret of man's instinct for those substances.

P.—What rules would you lay down regarding the use of condiments?

Dr.—Their use depends on circumstances. It is relative, first, to the nature of the alimentary articles. In the case of tasteless farinaceous or mucilaginous vegetables, or white flesh, by the relish

they impart, they enable a meal to be eaten that would pall the appetite before the wants of the body were half satisfied, while they increase both its reparative power and its digestibility.

In *the second place*, condiments are a necessity of climates and localities. In the native of the tropics, the energy of his vital centres is exhausted by the immense drain to the surface. His internal mucous tissues and their excretions require the stimulus of spices and peppers, and tea and coffee, which accordingly nature, ever provident of the wants of her offspring, places within reach of all, as the spontaneous productions of their climate. It is undoubted that the great abuse of these, and other stimulants, shortens life. The abuse in any way of this natural desire for excitants and stimulants should be strenuously combated and avoided. At this moment I recall the melancholy case of a gentleman I knew when practising in town, who killed himself, in a great measure, by the excessive use of red pepper. His last sufferings were deplorable, his death a lesson and a warning; it was, in truth, an appalling *finale*. In northern regions fats, and oils, and alcohol, constitute the predominent likings, as best counteracting the waste through the augmented respiratory function, and as best helping to relish the increased amount of solid nitrogenous diet, their more energetic corporeal exercise renders necessary. In humid or marshy countries also, the depression of the animal powers by repelled exhalation, &c., and in all climates the exhaustion of the organism by high nervous excitement, whether in the pursuits of business, of the professions, or of politics, or of those who, having none of these outlets of nervous power, create for themselves factitious excitement, in all these cases condiments to the food, something that raises its quality above quantity, are an indispensable condition of the relish of existence as well as of their food. For *to the masses* without the stimulation of the nervous centres these agents produce, and without the happy hours of corporeal ease and comfort they evoke, life would be almost unendurable. *In the third place*, condiments are used in relation to individual constitutions, to age, sex, health, and habits. Scrofulous and lymphatic constitutions, for example, require moderate stimulation, as almost if not absolutely, a condition of the due physiological play of their functions. Again, for the bilious and nervous, where already too much activity or irritation of the alimentary organs prevails, condiments, except in the greatest moderation, are as unsuitable. For the aged, whose sluggish functions require a fillip, they are often pre-

eminently adapted. Their regimen, however, must be regulated by prescription founded on long experience, or a perfect knowledge of all the conditions of each case. For the young *sugar* is the unfailing condiment. Great discretion, however, I admit, must be exercised as to the use of condiments, for they are very much abused. They are tipples in their way, and are not gratuitously or needlessly to be had recourse to. To the delicate and the valetudinarian, they must generally be prohibited. Hence, in the water-cure they are but sparingly and exceptionally used, all but the simplest and most necessary—salt and sugar. *Few things will so effectually prolong and aggravate dyspeptic disorders as their free use.*

CONVERSATION FIFTY-SECOND.

The digestibility and nutritive power of foods, and their adaption to the diversified circumstances of mankind.

PATIENT.—I SUPPOSE the circumstances affecting the digestibility of foods are very various?

DOCTOR.—Very, as you may suppose. Circumstances relating to the individual, and circumstances affecting the alimentary substances themselves, some foods being naturally more difficult of digestion than others.

P.—How would you define digestibility?

DR.—*The power which some foods have to yield more rapidly and easily than others the sum of their nutrient principles.* It expresses the relation which exists between the properties of a food and the actual condition of the organism, a varying relation, of course, in man's artificial state. It is the object of hygienic science and curative art to prevent, as much as possible, this variation, so that what *agrees* to-day shall not *disagree* to-morrow. In this uniform condition of health, the same food will always call forth the same assimilative power. It may be laid down as a principle that the less digestible an article of food is, or the more deficient in nutritive principles, the more rapidly it makes its way out of the stomach. Crude vegetable food is thus very speedily passed on to the bowels, as if by an instinct of the stomach, that it was not

worth its digestive energies. I am now, of course, supposing the digestive organs in a normal condition. Cases of artificial anus present these matters in an hour after eating, and very little changed. The more solid and nutritive substances, as bread or beef, remain in the stomach until their entire elaboration, till chymification is complete. I should infer, conversely, the lighter a diet is (that is the less nutrient matter it contains) the shorter time it remains in the stomach. It may be that the digestion of vegetables is, in difficult cases, partly accomplished in the CÆCUM or elsewhere; but this is a very clear point, that a meal of light vegetable food much more speedily leaves the stomach than the same weight of richer food. Hence the greater lightness of stomach from such a meal, and the speedier return of hunger than when more nitrogenised aliments are taken. As regards the early evacuation of the stomach, much depends on the quantity taken. Half a meal is speedily ejected.

Firmness of cohesion among the particles or fibres of a food is a circumstance that naturally opposes itself to the molecular changes comprised in digestion. Therefore minuteness of division of solids, or tenderness of fibre, will much promote their digestibility. The violent exertion of animals before death has this effect. This was the alleged motive of the cruel practice of bull-baiting, which I so often witnessed in my younger days in North Wales, as well as cock-fighting; these sports our more humane ideas have happily abolished. Incipient decomposition makes meat more tender (by disintegrating its fibres), and therefore, more digestible.

P.—But lessened cohesion surely is not all. For young animals are more tender and soluble than adult animals; yet the latter are generally allowed to be more digestible. Liquid foods are also less cohesive, but are admitted to be more indigestible.

DR.—Here you commit the error of making things similar that merely resemble. Young animals, sucking-pig, for example, have certainly more tender fibres; but then you must take into your calculation that these fibres are bathed in a viscid glutinous substance, if they are not half composed of it, which renders their flesh comparatively impenetrable by the gastric juice. Hence their extreme indigestibility. Again, your statement of liquid foods being indigestible, must be qualified. The solid portion of them is easily enough digestible, after the liquid is absorbed. The distension of the stomach by the liquid, when much other food is

present, creates uneasiness, and makes liquid foods be reckoned indigestible. But this logic is inconclusive. The fault is not in the liquid food, but in its being mixed up with other matters, with which it is incompatible. Liquid foods, in their own way, are perfectly digestible, that is, the solid portion of them, which alone requires digestion.

P.—I suppose whatever best gratifies the palate best promotes digestion?

Dr.—There is much foundation for your question. Hence, the unquestionable advantages of *good cookery*. It changes the organisation of food, corrects faults of tenderness, or flavour, or dryness, or moisture, or leanness, or fatness, but it does not alter its ultimate composition. It does not, in short, attempt to give us *chemical products* for *alimentary substances*.

P.—What are those circumstances in the individual that affect the digestibility of food?

Dr.—States of mind and body, or constitutional peculiarities, keenness of appetite, or the reverse, length of fast, the amount of waste produced by exercise, or by evacuations, the *heaviness* of the meal, both as respects quantity and quality, the state of the passions, &c. Hence, in one condition of the body it takes well with a diet, which in a different condition would be indigestible.

P.—I suppose repose after eating is favourable to digestion?

Dr.—To a certain extent, and under certain circumstances. After a full meal, when such full meal produces almost a morbid state, perfect quietude for a few hours may best get over the risks that have been run. Nobody, however, should eat to that excess; it is injurious excess. But moderate exercise, after a moderate meal, in the sound man, unquestionably contributes to digestion. The jaded dyspeptic, who has hard work to do, and who must eat to keep him up to his work, will find it otherwise. Two hours' perfect rest after his chief meal will be for him of absolute necessity. Repose after a hearty meal is natural. *But this refers to men as natural in their habits, as active in their exercise, and as robust in health as animals.*

P.—Is the *siesta*, or after-dinner nap, salutary or injurious?

Dr.—It depends. For the active and healthy, and in hot weather, if moderately indulged in, and as a preparation for the continuance of exercise, it may be allowable or expedient. It may also form a part of the regimen of convalescence, according to circumstances.

P.—I suppose Dr. Beaumont's tables speak out on this head?

Dr.—Yes; but they cannot be relied upon. They are not philosophically accurate. No valid deductions can be drawn from them. The *modifying conditions* of digestibility are not taken into account in his experiments. This faulty element very much vitiates the results and destroys their value as bases for inductions. But truth to say, the absolute and relative digestibility of alimentary substances, as well as the time necessary for their chymification, is an inquiry attended with the gravest difficulties, and would require for its settlement a host of experimenters, with means of varying their experiments, never yet adopted. This is a branch of science that yet requires to be created. If governments would set apart some of their criminals condemned to capital punishment to be subjects for experiment by commissions of the best physiologists in their respective countries—if a dozen San Martins were made to order, with doors opening into their stomachs, duodena and cæca—and these subjected to experiments, infinitely varied and extending over a few years, and all this done, short of compromising the lives, or injuring the health of each subject. In the researches made on animals, the different natures of the brutes, as well as their habits and natural dietetic repugnances, must be taken into account. In the experiments made both on man and beast, respect must be had to age, idiosyncrasy, the naturally healthy or morbid condition of the digestive functions, the state of the general health, exercise, and rest, the amount of excretory waste, the duration of the previous fast, the more or less nutrient character of the diet in ordinary use, and the climate, heat, and hygrometric state of the atmosphere. Then a series of alimentary substances taken from the vegetable and animal kingdoms, and compounded and modified, as skilful cooks would modify and compound them, must be interrogated as to the changes of gastric and intestinal action they produce. It is only by such a Herculean labour, accomplishable only by well understanding and well acting out the principle of the division of labour, that we shall arrive at data that would lead us out of the twilight into the sunshine of physiological truth, as regards the digestive operations.

P.—Imperfect as they are, however, I presume Dr. Beaumont's observations are the best we have?

Dr.—I freely admit that; and give him all the thanks and credit due to his labours.

P.—Will you sum up for me his results?

Dr.—Luckily M. Trousseau, an able French physiologist, has saved me that trouble. Here they are: *—

1st. Butchers' meat digests a little less easily than poultry, fowl, and game; and much less easily than fish: these are more digestible roasted than fried, and still more than when boiled; beef digests a little more easily than mutton; mutton than pork; but the difference is not very material. 2nd. Poultry is more digestible than game. 3rd. Fresh fish is more digestible than salted. 4th. Milk is more easily digested than any of the preceding, except fresh fish. Boiled milk is more digestible than raw milk; cream more digestible than butter and cheese. 5th. Eggs rank in the same degree of digestibility as milk. 6th. Soups and broths rank with the substances of more difficult digestion belonging to the first class cited. 7th. Farinaceous vegetables are as digestible as milk, eggs, and fish. 8th. Bread is less digestible than pastry (he means *blanc mange*), and potatoes. The boiled farinaceous seeds are the most digestible of this class. 8th. Fresh vegetables have the same degree of digestibility as the flesh of birds. Lastly, of all food, fruit is the most digestible. (See Dr. Beaumont's table of the relative quickness of chymification of the principal dietetic articles, in the Appendix.)

P.—Some of these results are very much opposed to our ordinary every-day experience. Milk, pastry, vegetables, and fruits do not certainly digest more easily than bread, or tender juicy meat. How do you explain the contradictions and disagreements of authors on the digestibility of foods?

Dr.—The source of error here is the taking for digestibility the time which food remains in the stomach, confounding of the simple passage out of the stomach of any article with the quickness of its digestion. So Sir Astley Cooper, from some experiments on dogs inferred that pork was more digestible than beef, because it sooner disappeared from the stomach. A very false test. For substances either naturally indigestible, or that contain little nutriment, are, by a sort of instinct of the stomach, first evacuated. But it was only summarily got rid of, as being the most refractory to the action of the stomach, and rejected on the same principle that a raw potatoe, or a piece of boiled leather would be rejected. Others understand by digestibility the facility with which foods dissolve in the gastric juice, or simply melt in the stomach. Hence

* "Thèse du Concours d'Hygiène," 1837, p. 24.

fats, which require only the heat of the stomach, and to be made into an emulsion with the pancreatic juice, in order to their absorption, because in excess they long remain in the stomach and are long to be absorbed.

P.—May it be set down as a principle, that an alimentary substance is so much the more digestible, as it approximates in composition to that of the animal structure?

Dr.—I think that may be assumed as a safe principle, *cæteris paribus*. I shall revert to this afterwards.

P.—Does the body ever digest more than its real wants demand?

Dr.—I believe not, generally. I believe Dr. Beaumont is perfectly correct in his statement that gastric juice is only secreted in the measure of the real wants of the body. So that of *really chymifiable and assimilable materials* no more can be appropriated than the exigences of the day demand. Those who get fat, bloated, and diseased, from full living, do so from the excess of unconformable matters introduced into their blood by simple absorption; of these sugar, oils, and fats, are the most abundant elements; these requiring and admitting no digestion, and being more than can be burnt in respiration, are stowed away as fat, or eliminated as bile.

I should here state, that a M. Blondlet, in France, followed Dr. Beaumont's line of research in experiments on dogs, with gastric fistulæ. He studied the action of gastric juice first on simple alimentary principles, and then on compound aliments, by two simultaneous methods—1st, the natural action of the stomach on foods; and 2nd, the action on the same substances of gastric juice taken from the stomach and placed in a sand-bath of 98°. Blondlet's results are summed up as follows:—I. Alimentary principles (*a*) Nitrogenous: 1st. *Fibrine*, duration of natural digestion, 1½ hour; artificial digestion, 2—3 hours. 2nd. *Albumen*, digestion of raw egg, 1½ hour; coagulated, 5—6 hours; its artificial digestion lasted from 3—4, 6—7, to 24 hours, according as it was more or less broken up or in a concrete mass. 3rd. *Gluten* (from wheat), exacted 5½ hours for its digestion. 4th. *Caseine* (coagulated), digested in 3½ hours; hardened by boiling, 7 hours. 5th. *Gelatine* is not coagulated by gastric juice. Beaumont infers that it is easy of digestion, because after an hour it had disappeared from the stomach. The error of such inferences we have pointed out. The experiments of Tiedemann and Gmelin are opposed to Blondlet's view here. 6th. *Mucus*, in any form, is incapable of being acted

on by the gastric juice. (*b*) Non-nitrogenous. 1st. *Fatty matters* pass the stomach without alteration—out of the stomach also, they are unacted on by the gastric juice. The pancreatic juice forms an emulsion with them, which favours their absorption. 2nd. *Pectine* is simply dissolved. 3rd. *Gum* the same. 4th. *Sugar* is subject to the alcoholic and the lactic fermentation. Blondlet asserts that it is not acted on by the gastric juice, neither in the stomach, nor out of it. It is apt to bring an influx of bile into the stomach. Sugar favours the formation of bile and fat. 5th. *Fecula* (or farinaceous matter) crude, uncooked, and mixed with cold water, it is simply suspended in the gastric and mucous secretions of the stomach. The starch grains rest intact. 6th. *Lignine* and the envelope of seeds and fruits are totally unaffected by the gastric juice. 7th. *Resins*, unchanged also. II. Compound aliments—(*a*) nitrogenous substances. 1st. *Cellular tissue*, that is, concrete albumen with gelatine. Enclosed in a muslin bag, it was digested in 1½ hour, in the dog's stomach. 2nd. *Muscle*, raw, digested in 4—5 hours; roasted, like raw meat, is only attacked on the surface, layer by layer; while boiled meat, and the tender kinds of white flesh, or veal, chicken, fish, &c., being more spongy and permeable to the gastric juice, are more rapidly chymified. 3rd. *Fibrous tissue* is very refractory to the gastric juice—requiring 10 hours to digest. 4th. *Cartilage* is more easily digested. 5th. *Bones* are easily digestible in the stomach of the carnivora; its organised part is dissolved like fibrous tissue. The calcareous part simply falls away as powder, and constitutes the bulk of the excrement. 6th. *Parenchymatous* tissues, as liver, lungs, brain, &c. The two former remained 4 hours in the stomach of a dog; the latter only two hours. 7. *Milk* is instantly coagulated in the stomach. The caseine is precipitated, involving a portion of the butter with it. Another portion of the butter floats on the surface of the mass. The sugar remains dissolved in the serum. The caseine is slow and hard of digestion. Milk is not an aliment very easy to digest; it is only digested as a solid substance. The more compact and bulky the morsels of curd, the more difficult it is to digest. Milk, therefore, is most digestible when associated with some other food, as bread, or potatoes, or rice, &c., which breaks up the curd into small masses by its interposition and multiplies the surfaces of contact. (*b*) Non-azotised compound substances, sugar, gum, starch fecula (boiled), pectine, acids, dissolve in water; others are insoluble, as fecula starch (crude),

resins, and woody matters. Fats and oils form an emulsion in the intestine.

P.—According to your reasonings, the experiments with isolated alimentary principles, or chemical products, in short, can only teach us very comparative truths; for they want two of the essential conditions of digestibility you laid down; 1st, the sapid odours, and aromatic principles inherent in all real aliments, their natural seasonings; 2nd, the original aggregation of the elements of a food, the natural proportions and connexions of its constituent parts. Will you give me your generalisation, or summing up, of the changes operated on food by the gastric juice?

Dr.—In this point of view, alimentary substances are divisible into four classes. The *first* pass unaltered through the alimentary canal, yielding nothing to absorption. These are *mucus*, *resins*, *lignine*, *fecula* (crude starch). The *second* class are dissolved simply in the gastric juice, as they would be in water. These are *albumen* (liquid), *starch* (cooked), *gum*, *sugar*, *pectine*. The *third* class, oils and fats, are unchanged by the gastric juice, and are absorbed "*neat* as imported," save being formed into an emulsion with the pancreatic juice. The *fourth* class of substances are the only truly chymified, and then they are simply modified in their molecular aggregation. These are fibrine, albumen (coagulated), caseine (solidified by heat), gluten, the interior of fruits and succulent roots, &c.

CONVERSATION FIFTY-THIRD.

The nutritive power of Foods.

Patient.—There is much vagueness in the popular idea of *the nutritive power* of dietetic articles. What does it express or represent physiologically or philosophically?

Doctor.—Simply the amount of assimilable materials a food contains. The existence of nitrogenised matter and of inorganic salts in food is the essential condition of their nutritive power. The *more* or *less* azotised nature of its ingredients, and the amount

of its earthy salts or inorganic elements are the *sign* and *measure* of this nutritive power. *The difference in the relative proportions of these constituents in vegetable and in animal foods respectively, is the foundation of the inequality of their reparative power.* Nitrogenous matter is the substratum of the animal organism, constitutes its *weft* and *woof*. It constitutes, also, the essentially assimilable part of food. Man's continued existence depends on the daily reception of as much organised nitrogenised matter, and inorganic matters, or salts, as the wear and tear of his system daily expends or loses. It has been well established, that man does not appropriate the atmospheric nitrogen, but only in the minutest proportion, or in exceptional cases. The Creator has appointed this element to be supplied in his food. The substances, therefore, most replete with nitrogen, gluten, and at the same time in combination with most earthy salts, constitute the basis of his nutriment. The nitrogenous principles *par excellence* are fibrine, albumen, caseine, gluten. The aliments in which these predominate *in connexion with the due proportion of earthy or inorganic constituents*, as flesh-meats, BREAD, eggs, the richer fruits, grains, and roots, are the staple of human sustenance. The relative amount of neutral azotised matter and earthy salts in any alimentary substance, determines how far it is fitted to construct or to repair the tissues. Herein lies the nutritive power of a food.

P.—It would thus seem that there is an entire analogy between the food of man and the food of plants. As they rob the soil of those elements which they elaborate into nutritive principles for the sustenance of man and beast, it is but a dictate of common sense, in order to prevent the exhaustion of that soil, to return the same ingredients to it in the shape of manure. Now it is well-known, that the value of a manure is in proportion to the amount of nitrogen and salts it contains. The non-nitrogenous matters, butter, oil, sugar, starch, gum, &c., you formerly showed, were mere respiratory elements.

DR.—Alone, they are totally insufficient for nourishment. Dogs fed exclusively on them, experience no great change for the first week or two; but then they rapidly fall away, and die in from the 35th to the 40th day. For the first few weeks in these cases, the necessary fibrine and albumen of the blood were evidently supplied from the living tissues themselves. Tiedemann and Gmelin's geese, fed on non-azotised food, perished from the 15th to the 25th day.

P.—*Apropos* of insufficient nourishment, what would you say were its sure signs?

Dr.—According to its extent and intensity, more or less of that which these starved animals presented, viz., swollen lymphatic ganglions, blood discoloured and diffluent, muscles pale and flabby, and a tendency to serous effusions in the pericardium and abdomen.

P.—Will you explain to me what *nutritive equivalents* are?

Dr.—They are numbers representing the comparative nutritive power of different kinds of food: in other words, numbers expressing the quantities of different dietetic substances which suffice to afford the same amount of reparative materials. For example, 100 parts of wheat flour are equal in nutritive value to 177 parts of rice.

P.—I suppose you will not contend, that, *in all cases*, the nutritive value of food depends on the absolute amount of azote and earthy matters it contains, but on the quantity it yields to assimilation? May not a highly nutritive substance be hard of digestion, and therefore not yield all its nutriment? A less azotised food may be easy of digestion, and yield all its alimentary constituents; and hence be really more nutritive than the richer food.

Dr.—Most intelligent of patients, you put the case well, and make a very proper limitation. This is one of the grounds, as you shall see when we come to discuss that subject, on which the *occasional* successes of vegetarianism can be explained, and are rationally explained, and that makes that milder form of alimentation suitable for many cases. Your remark only goes to show that the nutritive power of food, after all, is *conditional*, varying with circumstances.

The power to nourish in a suitable manner does not depend alone on the quantity of nutritive principles in the food, but on certain conditions which regulate the development of that nutritive power.

1st. Perfect digestion requires a certain *bulk* or volume in the nutrient mass. Concentrated food, that is food divested of its husk or fibre, its mere excrementitious or innutritious portions, is more or less indigestible. A certain proportion of non-azotised and non-nutritious matter is necessary to perfect nutrition and facile digestion. It breaks up the cohesion of the azotised and nutrient matters, and exposes a greater amount of their surface to contact with the absorbents of the intestinal track. A not unim-

portant function, also, of this woody and excrementitious part, is to maintain the peristaltic movements of the stomach and bowels.

2nd. The preservation, to a certain extent, of the natural form of the food, of the original aggregation, porportions, and connexions of its elements. Separate alimentary principles will not suffice. The living system will not put up with *chemical products* in lieu of *substantial aliments.* Gluten is not bread; fibrine is not beef.

3rd. The aromatic, sapid, piquant, or stimulating principles, although an infinitely minute, imponderable, unseizable, evanescent element, developes the nutritive power of foods by the vital reaction they call up, exciting the stomach-coats, nerves, vessels, and secretions. This they do by direct impression, and by sympathy with the olfactory and gustatory nerves. For example, upon the *ozmazome*, or aromatic principle developed in cooked animal food, much of its nutritiveness and digestibility depends. The bran contains what may well be called the ozmazome of flour. These aromas of foods are infinitely various, throughout both the vegetable and the animal kingdoms.

4th. Diversity and mixture of foods are essential to the nutrition of most men and some animals. A rabbit fed exclusively with wheat, barley, carrots, &c., will only live a short time: if these be given together, or alternated, they answer perfectly. The mixture of bread and meat augments the digestibility and nutritive power of both. Animals fed exclusively on bread, presented starch throughout the whole length of the intestinal canal; when meat was added, the starch was found only at the end of the small intestine.

P.—What is the foundation of the infinite varieties of regimen?

Dr.—The endless circumstances that modify the human organisation, age, constitution, maladies, temperaments, predispositions, idiosyncrasies, habits, bodily and mental exercise or rest,—all these modify the effects of food, and vary the amount and kind of repair necessary. One person will draw more nourishment from a vegetarian diet than from animal food, which would over-excite the digestive organs. Another person cannot exceed his usual allowance without deranging the balance of his health.

P.—I am anxious to know what you consider, or what medical authorities generally consider, a normal ration of food, or standard daily allowance for a healthy man.

Dr.—That very much depends upon the age, and amount of exercise taken. In the younger man all the organic operations are very active; there are great strength and great ability, and usually

willingness to exert them. Hence very copious supplies of food are taken with impunity, which at a later period of life, with lessened exercise would be highly dangerous. For a man taking moderate exercise, eight ounces of meat and 12 of bread or other vegetables are pretty near the mark. For a sedentary person a pound of solid food is quite enough. The loss sustained by the body, is that which is to regulate the amount of reparative materials. Repair should not exceed the loss. The corporeal expenditure presents great fluctuations, according to causes acting on the organism and modifying the vital functions. A greater portion of the waste of the body is simply fluid, as the exhalation from the lungs and skin, and the renal secretion. Of course, the solid matters carried off by these outlets is in very minute proportion to their watery vehicle. Sanctorius reckons the daily waste of the body at 8 lbs. This is too high. Haller makes it about 5 or 6 lbs. or $\frac{1}{25}$th of the mean weight of the body. Lavoisier's calculation is about 45 ounces.

P.—I should presume the sound man finds his surest guide, as to his dietetic conduct, in his instincts and sensations?

Dr.—Yes; if men would but uniformly obey the instinctive feelings emanating from the stomach unsophisticated, and stopped short when it was satisfied, they would seldom materially err either in the quantity or the quality of that which they ate and drank. Nature suffices with little, and that plain. Most people consume much more than the support of life demands. The stomach is daily surcharged at one meal or another. The safety valves may for a time work off the superfluity, but it stands to sense that that very extra-work must prematurely wear them out: and let me reiterate this truth in your ears, and instil it into the hearts and lives of your children, *that most men die of the closure of their safety valves, long before the rest of the mechanism is half worn out.* This is a solemn and momentous truth. It is enough for the body to repair its *normal* wear and tear. In doing that *it wears itself out.* But besides the natural waste to be eliminated, if loads of unappropriated nutritive material must find an outlet somewhere, *or the boiler of the machine burst*, the efforts of the secretory organs are doubled, till they fairly knock up. The stomach retaliates in dyspepsia, moroseness, gloom, and dejection of spirits, the miseries inflicted on it. The liver or the kidneys come to a "dead-lock," or we have serious lesion of the brain or lungs.

P.—You talked before of the *body-conscience*. I suppose it is by reason of silencing its dictates, and thereby perverting the natural instincts, that the more one eats the more gluttonous one becomes?

Dr.—Yes; but recollect, the instincts of organic preservation cannot be entirely silenced, the body-conscience cannot be seared with impunity. When its warnings are not heard or heeded, derangement of the health sooner or later, and lesions, or lessons more or less grave, must follow. It is, in these cases, that the high refinements of cookery are so pernicious. Much of the popularity of, as well as the ordinary drug treatment of society, is owing to the fact, that for a time it *masks* the impending ruin of the organs, and enables the individual to commit errors, when he is daily less able to bear them with comparative safety. Thus, the jaded organs of taste and smell are over-stimulated, a factitious appetite produced, and the capacity of the stomach over-stretched; its sluggish secretions and actions flogged up to a mad energy by alcoholic provocatives, which get the alimentary load disposed of for the time, *any how*, *at any risk*, till the day of retribution comes.

P.—What proportion of nitrogenous to non-nitrogenous matters, that is, of assimilable (sanguifiable) to respiratory (calorifacient) elements, ought the daily aliment of man to consist of?

Dr.—Liebig has attempted to solve this problem on a body of soldiers, by determining the weight and the elementary composition of the food ingested, and of the excrements voided, during a given time. Dr. Dundas Thompson has also attempted the same on cows. Liebig's conclusion, is about one part of blood-making materials, to four and a half parts of heat producing materials.

P.—You show, then, that the right employment of our stomachs, is one of the grand safeguards of health. When the organism needs a fresh supply of reparative materials, it is the part of the stomach to announce this *by its grumbling*, by the imperious demands and craving of hunger. When these demands are complied with properly, the stomach again, by an opposite tone, by a voice of satisfaction, indicates the general state of the body, and the individual state of the digestive viscera.

Dr.—Yes; that is the limit not to be exceeded. If the food be sound and proper in itself, no uneasiness will follow. If it be unsuitable, absolutely or relatively, it may be a few hours before that unsuitability is shown in the refractoriness of the stomach under

indigestible morsels. The after consequences depend on the nature of the food, and the susceptibilities of the individual. The feeling of surcharge and heaviness of stomach, ought never to be known. The concentration in the *overloaded* stomach subtracts from *muscular* and *cerebral energy*. A feeling of inertia and good-for-nothingness, replaces the comfort and alacrity experienced after a moderate meal. The senses are blunted, the intellect obscured, and sleep comes on, as in dogs who have just crammed themselves. The *habit* of excessive nourishment degenerates at length into a real need of the economy, and gives an undue predominence in size and activity to the digestive viscera.

P.—What are the after-effects of this excessive alimentation?

Dr.—Various. It does not create the sanguine temperament, but in those of sanguine temperament, it produces venous plethora, hæmorrhoids, a disposition to active hæmorrhages, and to cerebral congestions. The urine, the principal outlet of the azote of the system, evacuates an excessive proportion of solid materials; but still insufficient for the elimination of all the azote ingested in the food, it allows it to deposit itself in the shape of *uric acid*, and thus engenders rheumatic, gouty, and calculous affections. Obesity, oily infiltration of the cellular tissue, is slow to show itself in those of the sanguine and nervous temperament, who eat to excess; but it quickly gains upon the lymphatic, in whom all the excess of food turns to fat. The belly first becomes prominent, then the fat extends to the face, neck, chest, and shoulders; the limbs often, in almost ludicrous contrast, retaining their slenderness. As the weight of the body increases, its moving power diminishes by the atrophy of its muscular fibres In proportion as the powers of plastic life *work high*, by the excessive stimulation of an excessive nutrition, the powers of mental life *work low*. The activity of the animal, and the intellectual nature seldom co-exist, if the former be very great.

P.—But it is well known, that leanness is frequently associated with gluttony. How comes this?

Dr.—The excess is eliminated in various ways. When the alimentary mass is greatly disproportionate to the digestive ability, only so much is appropriated as the actual wants of the economy demand. The rest is evacuated by vomiting or diarrhœa, after a more or less painful or protracted stay on the stomach. Infants by their facility of vomiting, easily get rid of their excess of nourishment. Adults undergo the painful crisis of indigestion,

announced by nausea, hiccup, fetid eructations, headache, vomiting, troubled respiration, general pallor, with fatigue and weariness of the limbs. Sometimes the pylorus early yields; and allows a passage, *but not without protest*, to the undigested bolus, which acts almost as a caustic to the irritated mucous membrane, as it courses along, creating colic and diarrhœa.

P.—What is the influence of such stomach-abuses in the production of diseases?

Dr.—I shall come to that anon. In the mean time, suffice to say it is great, especially when repeated, and doubly great, when accompanied with excess of alcoholic liquors, which often for the moment mask the mischief, and give an *apparent* impunity to the offender; but *in the end*, only the more surely sealing his doom.

CONVERSATION FIFTY-FOURTH.

Quality of Food.

Doctor.—I have a few general views to offer on the subjects of vegetable and animal foods respectively. These, though nominally apart, virtually merge into each other by very insensible gradations. Vegetable nutriment approaches animal diet in fruits, roots, and farinaceous grains. Animal food approaches the mildness of vegetable products in cold-blooded animals.

Patient.—What is the peculiar effect of vegetable as compared with animal food?

Dr.—It tends to slacken the speed of all the vital functions, their digestion increases less the rate of the pulse, and the amount of animal heat. They nourish without exciting, or hastening the organic acts. But there are great gradations in their nutritive power. The farinaceous seeds supply the system with an abundance of nutritive materials, next to flesh meat. The farinaceous grain passes out of the stomach more quickly than flesh. Our ordinary class of fruits but mildly excite the gastric powers, and yield but scanty nourishing material. In southern countries the

fig or the dried grape, and other common vegetables, with bread, suffice for subsistence of the masses; but it is not so with us. The briefer the period of their stay in the stomach, as before remarked, the more are they unfit for substantial support. From their leaving a more copious and less altered residue, they are excellent adjuvants to richer diet, when constipation is an object to combat. From their power of quickening some intestinal operation, from their abundance of excrementitious matter, from its effects on the intestinal movements, and from the diluent action on the blood, fruits are admirably suited for a portion of the diet of the plethoric and the apoplectic. Indeed, they are, *judiciously taken*, an immense resource both for the invalid and the healthy. They are agreeable to every stomach, and the more agreeable the more the stomach is *unsophisticated*. They are only hurtful from being unripe, or used in excess.

P.—In what cases would you prescribe a diet of fruits?

Dr.—From their leaving a more copious and less altered residue, and from the quickening effect of this excrementitious matter on the intestinal actions, they are admirably fitted to constitute part of the diet of the habitually constipated. From the same aperient effects, and from their manifestly diluent action on the blood, and from the little carbonaceous or inflammable matter they introduce, they are pre-eminently appropriate to the sanguineous and the plethoric, and wherever there is a tendency to congestion of the brain or lungs, and in the decidedly bilious, and the nervously irritable. Fruits are less advisable for old people, and the inhabitants of cold and humid regions. Mushrooms are as nutritive as they are agreeable in flavour, but they are improper for delicate stomachs, for the young, and for convalescents. They are occasionally flatulent by their resistance to digestion, and not being sufficiently masticated.

P.—Do you reckon milk diet intermediate in digestibility and nutritive power between vegetable and animal foods?

Dr.—Milk diet is less digestible than is generally supposed. To most adults it is heavy, heating, and stimulating, especially if taken with much solid. It is too much of a perfect aliment in itself to be taken as a simple diluent to other food, save in the case of light farinaceous food. It will seldom answer as a substitute for tea or coffee, and never can be freely indulged in with an animal diet. *Per se*, or combined with fruits, roots, and farinaceæ, it is a soothing diet, determining only a moderate stimula-

tion. Its digestion and sanguification do not occasion any increase of temperature or acceleration of any function, except the kidneys. It is my opinion that as it forms man's first aliment, so it is best fitted, when judiciously taken, to form his last aliment. In the former it is nearly equivalent to sucking the maternal blood. In age and feebleness extreme, for the wasted and decaying powers of the fabric, if that fabric has in due season and by slow degrees been again accustomed to draw its nourishment from its primitive source, each meal of milk will be permanently more reviving and sustaining than any other form of food. First and last, in the shape of cheese, cream, and butter, man draws an unfailing source of "creature comforts" he could ill forego.

For the adult, the value and the efficacy of a milk diet depends on circumstances. In the dietetic treatment of disease, diseased tendencies, or simply delicate constitution, the philosophical practitioner will always have respect in the regimen he prescribes to the climate wherein the patient lives. *The air and the aliment must be made to compensate each other.* A humid, heavy, ungenial atmosphere, as that of great part of Britain and Holland for many months of the year, or the still more depressing sky of malarious districts, need a stimulating element in the diet, which tea and coffee, and light stimulants, are almost indispensable to meet. On the other hand, in elevated regions, where the atmosphere is rarified, dry, bracing, breezy, and the light is abundant—in short, where all the elements conspire to precipitate the organic movements—here the milk diet becomes an appropriate counteractive to all these stimulating influences. We find, therefore, that hardy mountaineers are generally patrons of milk diet.

P.—I suppose, therefore, you would recommend a milk diet to neutralise excessive morbid sensibility?

Dr.—I do not know anything better, with its concomitants, for persons of that temperament, if they will only have patience and perseverance to break themselves into a diet *at first* usually as refractory to their stomachs as it is repugnant to their prejudices. There is another class that will be much benefited by milk diet, I mean *blasé* people, for all those prematurely *used up* by the use of stimulants, and the abuse of the passions, a course of *water-cure* training, in combination with a good measure of this diet, which it will enable them to take easily, will restore freshness of feeling, and force of frame, that recalls once more the days of buoyant youth. But this cannot be accomplished in large towns.

Its wearied, worried, blanched inhabitants, must leave their factitious life, its social agitations, and the alternate organic excitement and depression of its fatal tear and wear.

P.—Will you give me your estimate of the comparative effects of a vegetable and animal diet?

Dr.—The organism experiences very different modifications under diet exclusively of vegetable or of animal substances. Animal diet accelerates the pulse and respiratory movements, augments the animal heat, diminishes the quantity of carbonic acid exhaled from the lungs, and gives more work for the liver to do. It promotes the secretion of the bile, but diminishes the activity of the kidneys; it also augments the solid materials of the urine. *Animal substances* determine a greater vital *molimen* and turgescence of the stomach, and more copious secretions. They are nutritive under a much smaller volume, occasion less flatulence, distend less the stomach, remain a longer time in it, and are more altered by its action; in short, chylify more thoroughly and rapidly. They furnish a homogeneous and white milky chyle, and produce scantier, but more odorous evacuations, and clear amber-coloured acid urine. They yield an acid chyme in the small intestines. They stimulate the action of the brain, and furnish to the muscles the means of speedy and direct repair. Vegetable substances, on the contrary, less excite the pulse and respiration, and less increase the animal heat, but increase the amount of carbonic acid exhaled from the lungs, and, therefore, little or no vicarious work falls on the liver. They determine less vital *molimen*, and less blood, and less secretion in the stomach; their nutriment is contained in much larger bulk, they distend more the stomach, and occasion more flatulence, but remain less time in it, and are altered less; they chylify less perfectly, and less rapidly; they yield an alkaline chyme in the small intestines; they afford a clear chyle-like lymph; they furnish by the abundance of their residue, more copious and frequent evacuations. The mucous secretions are greater, so also is the urine, but the urea is less.

Animal food is possessed of great reparative properties; it presents nutritive matter in its highest degree of physiological or normal concentration. Used discreetly, and qualified, diluted with a sufficient intermixture of vegetable food, and suitable exercise accompanying the regimen, it remarkably developes muscle, that is, lean flesh, and muscular power.

Vegetable diet never attains to the reparative power of animal substances, although it presents a gradual increase of nutritive power in the series of vegetables. Persons of strong constitutions and with stomachs capacious enough to make quantity compensate quality, who work hard, or take much exercise, *suffice*, with the best and richest form of vegetarian diet. Still it stands an unimpregnable truth, that in most people, in our climate at least, an exclusively vegetable diet is far inferior to animal food in getting up muscle and muscular power. Most pure and real vegetarians, in this country, have a pale, puffy look. The few who do really present superior looks and condition, owe it to the good bread, and plenty of it, with the eggs, butter, figs, raisins, milk, chocolate, and other nitrogenous food with which their diet abounds.

P.—So that you make out an intimate relation between the development of muscle and muscular power and flesh diet, and between pale, fat, flabby tissue, muscular weakness, and pure vegetable food?

Dr.—I think that may be established as a *general* proposition, of course subject to exceptions in the case of first-rate constitutions, and in those favourably placed for corporeal development. I contend for the mean or mixed diet, as obviating all the disadvantages of either used exclusively, and best maintaining the balance of the corporeal functions. But I would not contend for an animal diet to the exclusion of vegetables. Here would be as grand an error in its way, for an exclusive or excessive animal diet is quite as pernicious in its way, for it produces *plethora*, disposes to *inflammations*, *congestions*, and *abnormal secretions* from *kidneys* and *skin*. In the happy *mean* lies the truth—*medio tutissimus*. The mixed diet obviates all the disadvantages of either used exclusively, and best maintains the balance of the corporeal functions.

P.—From all that you have said, it is quite evident that the kind of diet is of infinite importance. But after all, granting the nature of the food and its preparation of the right sort, the appropriate use of any diet is entirely a question of circumstances, *the case and the occasion must govern its action*. Well, as the nourishment of the human being varies with circumstances, and these must be often hard to determine, or to prescribe absolutely for, yet there are others, such as the great epochs of human life, the rules of which are more fixed and seizable. I should like,

then, to hear some scientific opinions on the proper dietetic management of the human being from the cradle to extreme age?

Dr.—To begin then with the suckling infant. Nature, on every ground, by every claim of reason and instinct, intended the mother, if possible, to suckle her own offspring. This, while it conveys to the infant its most appropriate nourishment, most conduces to the mother's health. It has the advantage of a critical evacuation for her, and operates as a salutary derivation at the beginning and throughout the whole course of lactation. The secretion of milk is a powerful revulsive from the womb, favouring its return to the natural state, best annulling the consequences of the puerperal state. It counteracts the tendency to hæmorrhage, metritis, or peritonitis. It moderates the milk-fever, checks the puerperal perspirations, prevents uterine hæmorrhage, and suppresses excessive lochial discharge. Lactation, in fact, is a vent for materials that retained, would dispose to plethora, congestions, &c.

P.—But this duty, I suppose, you urge with the proviso that the mother is *constitutionally adequate to it*, and *takes to it willingly?*

Dr.—Of course; and let me add, that I will answer for it, that most defective women would find their constitutional adequacy and willingness, by a judicious use of the water-cure treatment. I have so often seen this desired result take place, that I speak by the book. The happy mother is thus enabled with benefit and advantage to *all* parties concerned, to enjoy one of the great blessings and comforts of woman's life, suckling her *own* child.

P.—How far does the moral as well the physical condition of the mother modify the milk, or alter its properties, and in this way influence the child's health.

Dr.—Very materially indeed. Diarrhœa, convulsions, epilepsy, and even death, are frequent results of the nurse's emotions. Women, therefore, of high nervous excitability, under no control, should not suckle; no more should those of enfeebled or lymphatic constitution, the scorbutic, the consumptive, the dyspeptic, or those who have any decided morbid predispositions. Robustness of constitution, however, is not an absolute desideratum in a nurse. Many weak women support lactation well, and even improve under it.

P.—What do you say of substitutionary suckling—that by hired nurses, animals, or bottles?

Dr.—It is proper enough, if the mother be disabled, and the best of all modes to give the child every chance of living and pros-

pering, of course respect being had to the person of the nurse, and the quality as well as quantity of her milk. The health must be guaranteed by a careful examination. Remember, also, that a nurse's milk may be too weak, or too strong, for the infant, starving it on the one hand, or producing diarrhœa, vomiting, and emaciation; or if the richness of the milk is disproportionate to the wants, or the digestive powers of the infant, then we have indigestion, oppression, and stupor, or agitation, vomiting, colics, griping, &c. Of animals, the goat is preferred for suckling, because of the size and form of its teats. The animal should be unexceptionable and well-cared for. Asses' milk is more analogous to the human, but it can only be given artificially. The bottle may be managed so as to be an excellent substitute for the teat. But artificial suckling on a grand scale is quite a failure, as statistics painfully prove. Nevertheless, in families, under suitable hygienic conditions, and directed with true *maternal care*, it should, and does succeed. Cows' milk is ordinarily used too creamy, and should be diluted with water.

P.—How soon would you begin the use of auxiliary means?

Dr.—If the mother's health demand it, about the third month, but ordinarily, about the sixth month; the nurse's milk should be the child's only nourishment. From this period, *panada*, arrow-root, milk, and other farinaceæ, varied or alternated, should be gradually introduced into the infant's diet; their gums being occasionally exercised by a crust, and so by delicate gradations familiarise the child to that solid food which the rising host of teeth point out as their appropriate work. In proportion as the babe is feeble, the intervals between its meals must be shortened, that is, from an hour-and-a-half to three hours; the infant satisfying itself each time. A premature and excessive feeding cannot be too severely reprobated. It produces the gravest inconveniences, diarrhœa, indigestion, abdominal engorgements, eruptions, *rickets*—the organs not being suitable to dispose of the nutriment they receive.

P.—When would you say was the most suitable time for weaning?

Dr.—In vigorous children nine months' suckling is sufficient. In the delicate, weaning may be deferred to the twelfth or even to the eighteenth month. But this late suckling always exposes the child to the risk of being weaned at the time when it is most fractious from the cutting of its teeth, and when the privation, therefore, will be most felt.

P.—What proportion of animal food would you mix with the diet of young children?

Dr.—Very little indeed, and none in many cases for the first five or six years of their life at least, or even much later, if the constitution be robust, the exercise active, and the habitation rural. For the first few years vegetarianism answers very well with children. It moderates the excitability of the digestive organs. All salted, smoked, or spiced meats; all heavy pastries and puddings, must, or should be, religiously avoided.

P.—How many meals a-day would you allow young children, ordinarily?

Dr.—Neither more or less than four. They should breakfast at eight, say on good brown bread and milk; at eleven, a light repast of bread and fruit; at two, a proper dinner—a helping of vegetables and gravy soup and bread, with a helping of farinaceous pudding; at five, a light supper, say half their breakfast allowance of bread and milk. They should be in bed by six, and accustomed to awake at six, and I would make it imperative they be washed always *all over* with soap and tepid water on going to bed; and *the moment of rising* to have a general ablution with cold water, if there is no contraindication requiring the modifications of bathing, advised by experienced water-doctors.

P.—What conduct would you recommend for the mother, who has just ceased suckling, for here we are left generally to our own guidance, the accoucheur taking the care of our wives at the commencement of lactation?

Dr.—In order to prevent the general plethora apt to ensue on the sudden stoppage and drying up of so large a drain from the body, it is simply necessary to diminish the supply of food for a few days, and to increase the amount of exercise. It may be often advisable to determine a slight revulsion *to the skin*, by packing, gentle sweating, and the shallow-bath, or *to the bowels*, by a sitz-bath of 65°, for ten or fifteen minutes, twice a day.

P.—Well, to pass at a bound, from the introduction into life, through the intervening stages, to the period of its decline, what counsels would you give regarding the diet most suitable for old age?

Dr.—Here, on every ground, the *most digestible* articles are desirable; because of the natural decay of all the powers, especially those of mastication, insalivation, and digestion. The appetite declines with the diminished necessity for repair. *Mode-*

ration in diet, therefore, is the indispensable duty, as it is the great safeguard of the old. He that would live to a strong and happy old age, must *diminish* his food, even to a strict and invariable measure. He who has been accustomed to live high, must now abandon many of the luxuries, not of life, but of the table, as well as its excesses, for the safety-valves cannot now get quit of superfluities so easily as in earlier days. Bouts of indigestion, flatulent distensions, and *crapulous* diarrhœa, drain heavily the old man's diminishing fund of vitality. Mere stimulants, are doubly pernicious at this age. Such temporary exaltations of power are equivalent to lifting up the wick out of its poor shallow wasted lamp, and obtaining a fallacious, fugacious, unnatural glare, at a ruinous consumption of the last remnants of the vital fuel, which cannot now be too carefully husbanded.

P.—Would vegetarianism answer for old age?

Dr.—For many old people, I believe it would answer, especially for those whose youthful appetite remains. Its light reparative power would answer the light waste that takes place; and its unstimulating nature would less exhaust the diminishing irritability of the tissues. Good bread, good soup, good vegetables, and light white meat, as chicken pounded, if necessary, and fish, I should recommed as the *physiological diet* of old age. Far away all indigestible, flatulent, viscid, acid, greasy, spicy, or high-seasoned messes. Even wine, commonly supposed the milk of age, is a *grand error* in the diet of the aged. Nothing is *more pernicious* than its habitual and indiscriminate use, as the alleged "othodox *cordial*" of old-age.

P.—Does difference of sex point out any material difference of diet?

Dr.—From the more delicate constitution and sedentary habits of woman, from her less exposure to the toils that exhaust men, she needs less nourishment and less animalised, less stimulating, and she instinctively craves a lighter diet, something sugary, savoury, and nutritious, in a small bulk. But too light a diet is not advisable on the other hand, the tendency of which would be to increase her nervous susceptibilities.

P.—What are the errors of the hygiène of woman? what the circumstances in their daily habits and modes, that most deteriorate their health?

Dr.—This is entering on matters more properly falling to be discussed when we come to speak of the nature, causes, and cure

of disease; but to finish on the subject of *sex*. The considerations of temperament, hereditary predispositions, and anterior maladies, must regulate regimen more than mere abstract sex. The great epochs of female life, menstruation, pregnancy, parturition, "change of life," &c., often call for important modifications of the nourishment. At all times a very digestible mixed diet is the most proper for woman. At the age of puberty her diet should be nutritive, but not exciting, its object should be to *sustain* but not to *drive* the secretory effort.

P.—The disorders of menstruation; can you give me any short and sage advice?

Dr.—As an old accoucheur I dare say, yes; but these we shall discuss at length in our more practical conversations on diseases. In the mean time to make a remark on the critical age. The tendency at this period to local congestions, as of the head, lungs, and uterus, will require great care to counteract. Here a strict habit of temperance, *in all things*, is a great safeguard. The diet of this period should be mild, but substantial.

P.—Does pregnancy necessitate any material modification of the regimen?

Dr.—Not in the well-regulated woman. The plethora apt to occur about the fourth month, calls for a reduction of diet, and of a lighter quality of diet. At a later period the increasing compression of the stomach forbids the ingestion of great meals. Smaller and oftener should then be the rule. Nervous and feeble women often experience, during pregnancy, a remarkable improvement of appetite and of condition.

P.—What foundation is there for the popular adage of "*eating for two?*"

Dr.—Oh, that is an old wife's fable—a vulgar error. *The suppression of the menses saves to the system as much nutrient material as the fœtus expends. Appetite* is to be the measure of the eating. An abnormal or voracious appetite, however, must be deceived, not gratified. Too much is made of morbid appetites, too much indulgence accorded them; where there is want of appetite, it must be stimulated carefully.

P.—But some women get blanched and bloodless during the first months of pregnancy?

Dr.—In these cases the blood-globules diminish, in proportion as they are drained to supply the new organisation that is being built up within the pregnant woman. This must be counteracted,

not by bleeding and depletion, which is madness, but a madness nevertheless *once* in vogue, but by a generous diet, and a course of bracing hygienic treatment. Our *water-cure* works wonders for these cases, and this not as a matter-of-course opinion from me, who rejoice in the name of *water-doctor*, but in the showing of common sense, and the practical proofs any one may witness. What is wanted is an energetic development of the *nutritive system* of the patient. Its opponents themselves will grant the water-cure the praise of accomplishing this. A great point for the pregnant woman is well to digest what she eats, and to eat with moderation, and of plain things; heaps of raw vegetables are to be avoided, as well as salted, smoked, and spiced meats, pork, &c. Spirituous liquors should be held in great horror, at all times hurtful as a part of woman's diet, they are then doubly hurtful, besides they are a poison to the child.

CONVERSATION FIFTY-FIFTH.

PATIENT.—I SUPPOSE *temperament* is a consideration that must very much modify the prescription of diet?

DOCTOR.—Very much. There is a fixed definite relation of alimentary matters to the living organism, but one very nice and difficult to discriminate. Van Swieten well observed, that "he who asks what diet is healthful, does the same as the man who asks what wind is a favourable one? no reference being made to the port he is bound for." The good wind for Lisbon is a bad wind for Copenhagen. So it is with individual organisms. What is suitable for one sort of constitution, occupation, climate, or habits, will rarely be so for those of a different sort.

P.—Do not *instincts*, or acquired tastes, if normal in themselves, express always a relation between the diet and the living body?

DR.—Yes; and they should not be violated. In vain will one try to surmount repugnances. Whatever *goes much against the grain* is refractory to the digestive powers. Many analogies will occur to the physiologist in the action of other organs, besides the digestive.

P.—Well, what do you say of regimen as suited to the different temperaments and peculiarities of constitutions?

Dr.—As a grand rule of diet, that is to be philosophically prescribed, or in relation to the organic conditions, the more sanguine the temperament the more vegetable the diet, as fruits, farinaceæ, and pot herbs; of meats, the white flesh of fowl and milder fish are most appropriate. The plethoric must avoid succulent food. To the moderately sanguine, Celsus advises to use freely different kinds of diet, to conform themselves to no particular regimen, but to follow a very diversified one. They must, however, use in *great moderation*, stimulant spices, aromatics, and seasonings. The best combination to the decidely "*bilious*"—who are frequently people who eat much, and digest well, and are costive, is a light vegetable diet, acid and mucilaginous fruits, &c. They must religiously avoid all oils and fats, as well as milk, sugar, honey, and the richer sorts of animal food, as game, and all smoked, salted, spiced, and prepared meats, in short, whatever promotes the formation of fat or bile.

P.—What are the digestive characteristics of persons of the nervous temperament?

Dr.—They have usually a capricious appetite, irregular in its returns. At one time their digestion is very sluggish; at another time very active, with organic movements in harmony with their mental mobility, or the facility and suddenness of their perturbations. They are habitually costive, but subject to occasional diarrhœa. With such people the digestive deviations require to be corrected; the blood-making and nutritive functions to be exalted. Coarse food, flatulent vegetables, and unfermented farinaceæ, as gross puddings, &c., are wholly unfit for them. Equally prejudicial, on the other hand, are high seasoned and stimulating alimentary substances, as over-exciting an already too mobile and exalted sensibility. But the philosophic principle of the regimen of nervous temperament is to develope the muscular and plastic (nutritive) systems, as the best counteractive to the predominant activity of the nervous centres. Here again our hydropathic training processes are of more utility than aught else, as thousands of formerly wretched dyspeptic nervous invalids can testify. Their diet should be red meats, game (not *high*), *light*, *half-brown*, *well-fermented bread*, the better sort of fish, good milk. Tea and coffee, and stimulants they must take in great moderation, many not at all, if speedy health-gaining is paramount.

P.—I should say it requires nice management to keep persons of the lymphatic temperament in health and high condition?

Dr.—It does. Their grand defect is a want of solid and plastic constituents in the blood; their tissues, consequently, are *below par* in vitality. Their muscular structure, for example, only half formed, pale, flabby, toneless. Vegetarianism will not do for them on any consideration. Red roast meat, venison, and game, and the best of it, all that is most savoury and nutritive, in due proportion, under a small bulk, with stimulating seasonings, agree best. White, fat, and viscid meats, heavy unfermented preparations of the farinaceous grains must be rejected as unfit.

P.—Will you pursue your train of observations on the subject of *diet* as modified by considerations of *constitution?*

Dr.—I need hardly say that robust constitutions do not suit with the diet that succeeds with the feeble and the valetudinarian. The light and little nutritive diet, best for the latter, affords their hardier organs no hold, and they fall away famished. They require tenacious, consistent substances, which vigorously exercise the digestive organs, and furnish a copious and strong assimilation. But I must qualify this remark. The kind of life a person leads is a great element in regulating the diet; strong organisms require strong diet, only on condition of spending by exercise or labour the excess of materials it produces; otherwise an exuberance of blood and health is produced that is still more fatal than inanition. The rankest or fattest soils neglected are most overgrown with weeds. So over-gorged, strong men, who lead inactive lives (as boxers who often retire from the feats of pugilism to the functions of publicans) die prematurely, if indolent and great eaters or drinkers.

P.—But there is a class of persons originally delicate or debilitated, but whose position in life compels them to constant, if not sometimes too great, exertion. These cannot stand a squashy feeble diet, to match with their feeble organisms?

Dr.—They cannot, and it would be better if they could. By heaping on fuel they can get their machines to work at an unwonted rate of speed and power, *but at the expense of soon wearing them out.* Less work, and less and lighter diet would have saved many of the world's brightest luminaries, whose lights were prematurely extinguished. However, the nourishment of the delicate should be substantial, but mild, digestible, and uniform, taken in small quantities, and repeated several times a day. They

cannot stand variety, or irregularity of habits, not even of meal hours.

The system is profoundly modified for the better by long continued and judicious dieting. It is in our power immensely to improve and invigorate the constitutions of the originally delicate and *débile*, even to ameliorate whole breeds of mankind, by a uniform and carefully appointed dietetic course, with a continuous system of physical training, such as that constituting the whole life at the water cure. Indeed, as regards their power to correct defective constitutions, hereditary taints and other faults of organisation, the importance of diet and hygienic regimen cannot be overstated or over-rated. Next to air and climate these are most powerful modifiers of man's moral and physical conditions; it is even in their power to supply the defects of many other hygienic conditions by long-continued dieting. Diet is omnipotent to save or to kill, according as it is well or ill-directed. The development of man is as much a product of nutrition as of hereditary agencies. This part of hygiène must and will be more studied and practised.

P.—Well, what directions as to conduct would you give in regard to the taking of our meals?

Dr.—I would not advise you, for example, after a long and hard bout of study or mental application and bodily inactivity to go immediately to table. Moderate exercise should always precede a repast, but not to fatigue, for then it would mar both appetite and digestion.

Calm of mind is necessary before, at, and after meals. Never eat immediately after vexation, agitation, or trouble. If you cannot resume your tranquillity, be satisfied with a cup of tea, cocoa, or what you are used to, and a little bread and butter.

Avoid as you would the —— *stomachic* "*bitters* and *cordials*," "*dinner pills*," and "*digestive draughts*," "*baume de vie*," and spirituous, peppery, and spicy stimulants in every guise; in short, the whole destructive farrago. They either blunt the natural appetite, or provoke a factitious one, in both cases equally marring sound digestion and assimilation. When things are so bad as to call for these provocatives, it is high time to look about you. The ingurgitation of wine *between* the courses at table, will be avoided by every man who wishes to live physiologically, because it permits or rather provokes to eat beyond the wants of the body, beyond *the powers of digestion*. The natural appetite is that which is

pontaneous; it is patient, and without uneasy craving, has no sinking and fainting feelings. The natural aversions of taste and appetite are to be respected. If the stomach is inactive, do not coax it to its work by stimulants, but rather inquire into and rectify the causes of its inactivity. All irregularities of appetite denote suffering and derangement of the digestive organs. Care should be taken not to mistake the morbid gnawing of a weak irritable stomach for appetite; much injury is done by this mistake.

A clean and clear appetite should be satisfied then and there. Do not wait till the feeling rises to an inconvenient weakness, or painful hunger, in which case it should be moderated at first by a glass of sugared water, or by a plate of soup, before eating solid food.

After long abstinence, a very spare diet, or great privations, a rich, copious, and exciting diet is dangerous, and often spoils a nice convalescence.

Meals should not be too near each other, nor too distant. In the first case, the act of digestion too frequently repeated fatigues the stomach, and deteriorates the process. In the second case, hunger is apt to be too keen, and appetite is only satisfied by gorging inconvenient quantities. Hence laborious digestion, and cerebral or pulmonary congestions, morbid enlargement of the stomach, hypertrophy or thinning of its walls.

The time necessary to the digestion of a meal varies from *three* to *five* hours. After this appetite recommences. The best interval between meals is about *six hours* at an average, making three daily repasts. Some do better with two good meals per diem. This must be regulated by the substantialness of the meal, and of the labours that intervene. Some take only one chief meal—the dinner, and breakfast a very light tea meal. But in the one meal case, dinner is too much of a feast, and is only got through with, and finely disposed of, by dint of alcoholic stimulants, kept up, more or less, during dinner, and for sometime afterwards, a practice, at the best, which is *very quick living!* The number and periods of meals must be proportioned to the wants of the system, and according to individual circumstances. The robust and the feeble, the young and old, the active and the sedentary, the inhabitants of cold climates and those of hot regions, are each placed in different categories, and demand corresponding

variations of diet. The amount of waste the body undergoes, if it can be ascertained, is a great regulating principle. No *absolute* precepts can be given. So far as the habits are natural, and the body unsophisticated, the *returns* of appetite as to *times* of eating, and the dictates of appetite as regards quantity and quality, may be safely relied upon. But it may be laid down as a principle, that one meal should be digested before another is received. Eating little and often is bad, at more prolonged intervals good. Children, on account of their more rapid vital actions, and because of the surplus materials required to build up their structures, over and above repairing the daily waste, require food oftener than adults.

However meals be regulated, they should be *regular*, for hunger obeys the law of periodicity. Everything must be arranged for this,—for hunger to recur periodically, and to satisfy it when it does occur. *Never eat in the intervals of meals;* appetite is then illusory, and leads the way, however slowly, to bodily derangement and vexation of spirit.

During a meal breathe a pure air continually renewed; *close* dining-rooms are bad. No tight-lacing at table, if anywhere else. Exclude also during a meal all heating controversy, all lugubrious sentiments, all acrimonious passions. Give a loose, if possible, to a free and cheering spirit. What is eaten in the midst of genial sentiment does good. Under cross-grained perversity, discontent, or any spice of malevolence, digestion languishes and suffers much. Such is the *law*.

Some prohibit reading during a meal, and this *is* a good rule, *if such reading pre-occupy the mind.* But if it do not, a lonely moping person otherwise, over his unsocial meal, with a pleasant book, may have all the agreeable excitement of agreeable company, and will have less inducement to eat rapidly, and injuriously hurry over his meal. Social meals certainly delight most. Appetite is both freer, and digestion easier.

The division of the daily quantum of food is not equal. The quantity, as well as the nature of the food eaten at a meal, must vary with the employment of the time, the customs of a country, and the exigences of public business or private affairs. The Romans took their dinner, their most copious repast, after the active business of the day was over. Men of active spirits, however, I think generally conform to this rule. A heavy meal is an interruption at midday to most people, yet in Germany the early dinner is universal.

Eat little, and of few articles, is a dictate of high dietetic philosophy, if you wish to enjoy the delicious sensations of *flush* health, and of perfect mental calm and clearness. Not that I should renounce or repudiate pleasure in eating, or lay human nutrition under any ascetic restraints. But it is a grand mistake to suppose that enjoyment is wanting or lost in keeping within the simple limit of nature's wants. Quite the contrary; the relish is the keener, and it pays its regular untiring visits.

If at any time excess be committed, let abstinence following neutralize it.

The choice of food is to be regulated much by the instincts and tolerance of the stomach. The best is that which one digests best. Food at a high temperature is prejudicial. Perfect mastication is the best preparative for perfect digestion.

The amount of liquids to be taken, will depend on the waste of the fluids that take place by the skin, lungs, kidneys, or bowels; and according as absorption by the pulmonary and cutaneous surfaces is more or less active; as the air is more or less heavy and moist; and as the food is more or less watery.

After eating rest a little, or walk slowly; but avoid hard work of body or mind, all angry or violent emotions, or even the worry of petty matters.

P.—Well, to end these observations, which I find replete with valuable practical lessons, tell me your opinion of the *siesta*, or after-dinner nap.

Dr.—It will do for very young children, and for old men, for persons weakened by disease, or exhausted by fatigue. It is especially injurious to the sanguine and the plethoric. This need of sleep indicates a laborious digestion from an *excess* of food. The energies of the brain are temporarily drafted off to reinforce the efforts of the stomach, struggling to shake off the burden imposed on it. This process of stomach irritation and overwork, and the continual drains of energy from the brain that it induces, dispose to cerebral congestion and apoplexy.

P.—What would you do in that case?

Dr.—Most plainly what nature dictates to be done. Diminish the quantity of food. Choose it of very digestible quality, but not abundantly nutritive; and promote digestion by gentle exercise after eating, in an airy room, or lounge in the open air.

CONVERSATION FIFTY-SIXTH.

Tea and Coffee—Aromatic "tipples."

PATIENT.—Do you not consider a well-prepared infusion of tea or coffee a most delectable beverage?

DOCTOR—Unquestionably it is; one as it is exquisite in its flavour, so it is cheering and genial in its stimulus, that is, when taken at the proper time, and in the proper circumstances; a genuine, and often recommendable tipple, one renowned in all climates, and among all classes, as a refreshment creating the most amiable moods and innocent feelings of human nature; the drink *par excellence*, of sensibility and refinement, the source of vigour to the weary, of buoyancy to the depressed, of mental power, and ease, and happiness to all.

P.—Is there much difference in the chemical nature and physiological action of tea and coffee "tipples" as you call them?

DR.—Not much. Their most active and beneficial constituents, *theine* and *caffeine* are identical in composition. This seems to me, the more I think of it, a very remarkable fact in the history of man, that two plants belonging to different natural orders, and growing in different regions of the earth, should be analogous in their constituents, should contain the same, especially one identical and pre-eminent substance, and be for that substance universally prized, praised, and patronised.

P.—Is not this because it meets a necessary want of human life? Have not in these matters the instincts of nations preceded the discoveries of science?

DR.—This is another of those remarkable facts in human history I have just alluded to. *The habits of communities, supposed to be accidental, and often accused as sensual or sinful, are proved to be in accordance with the teachings of philosophy, are based, in fact, on attention to the laws of nature.* I shall show you, by-and-bye, more instances of such anticipation of scientific truth in the dietetic *instincts*, habits, manners, and customs of peoples. Another fact, full of dietetic significance, as connected with this subject, is this, that tea and coffee were the original indispensable tipples of nations whose food was chiefly vegetables.

P.—But what is the fascinating element in these tipples, that makes them so popular with all, but especially most popular with the wisest, most refined, and most amiable.

Dr.—The secret is *their action on the nervous life of man.* This action by some stimulating agent of whatever nature, is an indispensable necessity for most people, for the savage as for the civilized; and the necessity is greater, just in proportion as the nervous system is cultivated into a preponderating activity over the muscular system. Nervous exhaustion is then greater then mere muscular waste; for nervous life is *intense* life, the most enjoyed life: but the most wasteful of life's mechanism and of life's supporters. The means of replenishing that nervous waste are found to exist more in the *quality* than in the *quantity* of the ingesta. In the absence of a peculiar *quality* in the diet, a blank is felt. Hence the craving to supply that undefined vacuity. Among other things, the products of fermentation and distillation, and opium, are found to impart to the sustainers of organic life that *quality* of support, that *stimulus* that is craved and needed for animal or intellectual life. But a very slight experience suffices to prove, the almost indiscernable line that separates *use* from *abuse*, in these *dangerous stimulants;* and how fraught with calamity to the individual, is the passing of that fatal boundary line. These, therefore, with the wise and the good, have had always rather a restricted patronage, knowing how difficult it was to extract the honey without receiving the sting. But with tea and coffee tipples it has been, as a general rule, far otherwise. All the knowing who have turned a deaf ear to the sirens, ALCOHOL and OPIUM, have nevertheless, willingly embraced the blandishments of tea and coffee, no small proof of their harmlessness. Depend upon it, *the constituents of men's food determine to a greater extent than is supposed, the direction of their mental activity. That they find out. That which modifies the vital processes, modifies to a great extent the thoughts, views, purposes, will, appetites, and passions.*

That which gives the universal prevalence to tea and coffee, as modifiers of the nervous life, is their freedom from the objections attaching to the alcoholic or *intoxicating* drink, or the opiate, and from their analogy to soups in their action, as in their constituents. They equally with the latter, vivify, cheer, and excite for the time. But soups are comparatively long and difficult to make, and are not always relished when they are made, and are besides fitter for

replenishing or ministering to muscular, than nervous exhaustion or weariness. Alcoholic tipples intoxicate, over excite, congest the brain, and end with producing *stupor* or *brutality*. But contrary to these, tea and coffee tipples are *quick* and *easy to make*, create no mess, and are always relished at their proper seasons, they never depress or obliterate the intellect, but elevate its exercise, expand and ennoble the being. In fact, these aromatic tipples are well known to be the best neutralisers of the after effects of alcohol and opium, and best dissipate the cerebral congestion they leave behind. Another essential difference between tea and coffee, and alcohol and opium, as actors on the nervous life, is this, that the latter require, to produce their effects, a continually *augmenting dose*. The dose of tea and coffee tipples are one standard and permanent.

P.—In all this, I see, then, that tea and coffee drinking are necessary elements and phases of man's moral and physical being; that if these tipples did not exist, the instinct of human nature they aim to gratify, would seek their substitutes or equivalents elsewhere; that particular dietetic habitudes, apparently the offspring of fashion, have, in reality, an origin and foundation in reason or human wants; and that praise or blame of these "diet-drinks," without computing such necessary elements of the calculation, is nothing better than simple partiality on the one hand, or pure prejudice on the other. Will you now have the goodness to describe to me, the peculiar principles or specific ingredients of tea and coffee?

Dr.—Tea consists, 1st, of a woody matter which constitutes about half of the leaf; 2nd, tannin; 3rd, gum; 4th, an essential oil, on which its aroma depends; 5th, the highly-azotised crystalisable substance already referred to, *theine;* 6th, another azotised matter, identical with caseine; 7th, various salts, sulphur, lime, magnesia, iron, constituting the *ashes* of the leaf. *These principles are soluble in boiling water.* The rest are insoluble, viz., 8th, albumen; 9th, chlorophylle or colouring matter; 10th, extractive matters; 11th, resin; 12th, wax. The constituents of coffee are analogous.

P.—In all these ingredients, *certes*, there is wherewithal for a very potent action on the animal economy. What is the proportion of nitrogen in tea?

Dr.—*Greater than in any other vegetable.* A perfect infusion of tea, on evaporation, leaves a dry residue, which contains about

four and a half per cent. of nitrogen. Theine exists in the proportion of from 6 to 7 per cent. in tea. Theine contains about 29 per cent. of nitrogen.

P.—I am anxious to know the specific physiological action of your aromatic tipples on the system.

Dr.—This is exceedingly difficult to appreciate, simple as the investigation may seem. Their effects are modified by the temperature and strength of the infusion, the amount of milk, cream, or sugar in it, the fulness or emptiness of the stomach, the constitution, temperament, health, habits, age, and climate. Then we must ascertain in what dose its use (or physiological action) consists; and where *abuse* (or its pathological action) commences. On account of the difficulty of fixing the value, and eliminating the effects of each of these elements, of the action of tea and coffee nothing is more unsettled among scientific men, than their specific operation on the human body.

The ingestion of these tipples, determines *immediate* and *secondary* phenomena. The first set are due to the action of heat, and are the same as those of the ingestion of warm water simply, that is quickening of the pulse, with a sense of agreeable warmth, and gentle stimulation all over the system, increased energy of the vital movements, and, if the quantity drunk has been great, a sort of fever, terminating in a sweating crisis. Taken cold, these tipples by no means develope the same excitement. Caloric is an essentially diffusible stimulus, but in this way its influence is very evanescent, and is followed by weakness. One grand virtue in the action of tea and coffee, one important service they render (*hygienically*, if not *therapeutically*), is that *they enhance and prolong this excitant influence*, making that effect last for hours, which would otherwise be dissipated in a few minutes, *and this without the drawback of subsequent depression.*

P.—How different is alcoholic stimulation from this. If it exalts you now to the third heavens, by-and-bye it lets you down into the deepest —— blues, but not the etherial, by no means.

Dr.—Besides, alcoholic stimulants are *pure* stimulants, have in themselves no restorative constituents, no real elements of strength. They hasten the vital processes unduly, and without any equivalent. This unnatural activity, as regards the digestive and plastic processes, generally has the effect of deteriorating their results. This is only the case in *gross abuse* of tea and coffee

tipples; with the alcoholic beverages, these effects can *scarcely be separated* from what may be considered as their use.

P.—In other words, you would say that the stimulation of alcoholic drinks is like that of opium, *pathological;* the stimulus of tea and coffee salubrious, *physiological.*

Dr.—That expresses the idea pretty neatly. Tea and coffee, I was going to observe, act primarily on the extremities of the gastric nerves, and on the vascular system. In those accustomed to them, they do not materially quicken either respiration or circulation; but they very perceptibly impart force and firmness to the pulse. They have a decidedly tonic action on the heart and blood vessels generally. The difference in their tissues before and after these tipples, is that of a loose cord and a tense cord. At the same time, they both tend to increase the vigour of the circulation on the surface, and to strike out vigour from the vital centres to the extremities. But the nervous system is the great scene of the vital impulse and excitation; they produce a gentle mental intoxication of its kind, which I admit it is possible to *abuse* and *over do.* For such, if in excess, a sure sign is a hurrying on of the vital processes most frequently pernicious in the end, sometimes admissible in the aged, but never permissible for the young. Besides the lucid, quiet, intellectual condition, tea and coffee produces their specific action on the brain, is demonstrated by their power to ward off sleep.

P.—You will admit, that the influence of tea and coffee diminishes by habit?

Dr.—To a certain extent, and in a certain sense, that is true. For example, the *after effects* diminish. With some, tea and coffee cease to produce any inconvenient wakefulness. *But habit never blunts the individual when tolerably well, to the cheering, domestic usefulness of their qualities.* In this they vindicate their claim to be taken into the lists of real alimentary substances, which always nourish and cherish, and the *better,* the more the system is accustomed to them.

P.—Does not the popular remedy of strong tea and coffee for headaches, confirm your view of their specific action on the brain? or what *is* the *modus operandi* of this curative effect?

Dr.—In headaches dependent on, or connected with, slight cerebral congestion, the fact is as you state. How the remedy operates, whether it be by a simply *general,* or a specific *local,* action, it is difficult to affirm. For my part, I am inclined to believe, that it is

partly in both ways that tea or coffee dissipates the cerebral neuralgia and congestions referred to; and this on the one hand, in consequence of its stimulant action on the general circulation, in which of course the brain participates; and on the other hand, by the peculiar modification it impresses on the circulation of the head *and gastric centre.* If it were not so, if tea and coffee had not a specific *local* action, why not employ other *general* stimulants, as ether, ammonia, ginger, anise, nutmeg, balm, sage, peppermint, &c. These, however, do not exercise the same influence upon the brain and *other* ganglionic centres; they are null and void for the effect needed in the case you quote. Tea and coffee excite the dullest intellects to work; but especially, do they stir up the thought and power of the intellectual and refined. In saying this, I do not mean that they will *create* brain or heart qualities, that they will give sense to fools, sentiment to rogues, or excite sparks where no fire is *latent.*

P.—I suppose you consider also, that tea and coffee relieve headaches, by removing those digestive embarrassments that, according to your pathology, lie at the foundation of most headaches.

Dr.—You have hit near the mark. In the one way or the other, we may establish *some* of the pretensions of your "tipple" remedy for headaches. It often fails, however, adding to the acidity of stomach which often prevails in many cases of nervous and bilious headaches.

P.—What is the effect of tea or coffee taken upon a heavy or hearty dinner?

Dr.—It excites the system less and less directly; and the stomach more and more directly, than under other circumstances. One would say its *constitutional* effects were extinguished in its *local* action. But whether that local action be hurtful or salutary, depends upon whether the individual be of feeble or of strong digestive powers. In the former case, a strong cup of tea or coffee will infallibly embarrass digestion, as every dyspeptic knows by experience. Coffee has the disturbing effect still more than tea, in consequence of its empyreumatic qualities, which tea has not. It is the nature of empyreumatic substances (as we shall see when we come to speak of salting, and curing, and smoke-drying of meat), to check the processes of solution and decomposition. Smoked flesh by reason of this resistance to change, is difficult of digestion. In this way, that is by interrupting the molecular changes, a *cup* of *strong* coffee after dinner will *check digestion* in dyspeptics. In

them, when digestion is over, and the stomach jaded with its work, then a cup of coffee or tea affords relief. But the case is quite different in strong stomachs, actively excited by stimulant viands, spices, sauces, and liquors. Coffee is then found to act beneficially, to be craved for, and well borne. It checks the fermentative commotion of which the stomach is then the scene. Tea does not in the same way impede digestion; its effect is to quicken the intestinal actions, to accelerate the process of digestion. Both these tipples neutralise the stupifying fumes of wine, and they ward off intoxication.

P.—What is the effect of taking tea or coffee fasting; that is, as a substitute for food, or as a put-off to appetite?

Dr.—A more palpable, in some a more distinctly morbid excitement of the nervous system, a feeling of dragging and emptiness at the stomach, with an uneasiness simulating hunger. These effects are, of course, modified considerably, if there be much milk, cream, or sugar present; then the tipple, if not too strong, is a most refreshing cordial—a genuine solace from fatigue, worry, or care. But all puts-off of this sort, inasmuch as they are defrauding nature of her rights, must, if frequently repeated, be injurious. When the stomach wants and asks for building materials, *mortar* alone, however good in itself, will not suffice. This is not the *use* of these beverages, but clearly the *abuse*.

P.—I find the fault of most dietetic writers I have read to be, the denunciation of this and that article of food or drink, from arguments founded on their *abuse*. Suppose after a hearty dinner, too many strawberries are eaten, the result very probably will be, colic in the evening, and bowel complaint at night. In the morning the cry will be, that raw fruit is a very bad thing, *especially* strawberries, and never to be eaten again. No consideration is made for having transgressed the conditions on which their wholesomeness depends—no acknowledgment made that they are very good things when eaten in due season and measure.

Dr.—The *use* of a thing must be carefully separated from its *abuse*. If the latter is to be a valid ground of their repudiation all the best things would be swept away from man's enjoyment at this rate. For what boon of heaven is not abused? The *tea*-totallers often run into excess in their tipples, as the wine, beer, or spirit-drinkers in theirs, the beef-eater in his meat, and the vegetarians in their vegetables. To my knowledge, tea and coffee tippling is quite as much abused in their way by the *soi-disant*

temperate, as stronger potations were erst by many. I am very far from contending that the abuse of even the mild aromatic tipples is without peril, or that they are suitable for every kind of constitution, life, and labour.

P.—It is alleged against tea and coffee that they emaciate, destroy the appetite, congest the brain, &c. Are these allegations true?

Dr.—I don't believe a word of them. Before we condemn these tipples as causes of ill health to those who are accustomed to them, and who use them discreetly, we must first carefully examine what other conditions of corporeal derangement attach to their modes of existence, *whether there be not a systematic violation of the organic laws in other particulars*, and the fault covertly, disingenuously, or ignorantly saddled on the tea or coffee. In the cases of ill health alleged, it will be discovered, that the dietetic habits in other respects, the mental labours or troubles, the confinement, close air, and sedentariness of in-door occupations, badly-planned hours of diet, bad articles of diet, and bad cookery, late sitting-up and later rising, the pernicious indulgence in drams and drugs, the one to counteract the other;—all these, and a thousand other equally potent but less palpable sources of ill health, never enter into the calculations of many who denounce tea and coffee.*

P.—Thanks. Now, to return, you admit that *green* tea is not considered pernicious without cause. Will you explain how this is, also the morbid effects it produces?

Dr.—Green tea has a poison in its pellicle, a coating of prussiate of potash; and its dose is far from *imaginary* or infinitesimal. The symptoms of the veritable poisoning with green tea are—high nervous irritability, yawnings, pinching and pain in the stomach-pit, palpitations of the heart, tremblings of the limbs, constric-

* Mrs. Heskeseth Nicholson, keeping a school in New York, a widow, and full of trouble, neglecting exercise, and violating every dietetic rule, falls into ill health—"*a low nervous way.*" She has strong tea or coffee brought to her almost every hour of the day "to keep up her spirits," to "sustain her under her labours and trials"—but finds out at length that this strong tea and coffee are slow poison to her. So they might well be. She abandons her tipples, regulates her diet takes such simple farinaceous food, as is suitable for a *chronic gastritis*, alters her mode of life, courts the country, takes ample exercise, and recovers her health. Henceforth she has *a mission* to perform—to denounce flesh eating and tea drinking, as the greatest evil of society, the most fertile sources of disease, and the root of all mortal woe.

tion of the head, sleeplessness, low spirits or despondency. These symptoms subsiding, leave behind them a sense of weariness, weakness, and oppression—and all this in persons who take with impunity black tea. The extreme symptoms I have described are of rare occurrence; and I should mention, at the same time, that I have known many notable exceptions to the disagreeable effects of green tea, in both young and old. During a summer passed in the Tyrol, when an invalid, I drank two large cups, night and morning, of tolerable strong green tea; there being no black tea to be found. I could not detect any ill effects, and in the evening I always found it a speedy and unfailing soporific.

P.—What are the effects of the excessive use of coffee or black tea?

Dr.—Nervous excitement, agitation, want of rest, convulsive twitching of the limbs occasionally, and always a species of intoxication, with a feeling of faintness, feebleness, and failure all over the body; a tremulous weakness and sense of sinking at the stomach-pit; and a craving for nourishment a few hours after a meal, and before hunger should have returned. Great tea tipplers are often great dyspeptics, meagre, sallow, sickly, and weak. There is great difference in individuals as to the *tolerance* of these effects, and of the influence of habit in parrying them. The robust suffer much less than the weak.

P.—How do you explain these morbid symptoms?

Dr.—Very easily. Stimulants, in undue dose or too oft repeated, impart an unnatural activity to the vital actions and apparatus. Digestion and assimilation, the plastic processes generally, of which I have told you so much, participate in this morbid speed; *but they are imperfect in the same proportion. Hence defective materials of repair are elaborated and laid down.* Waste, also, is preternatural and unhealthy. Between the two the nutrition of the body is perverted. The due balance between waste and supply, both as regards *quantity* and *quality*, is upset. The result is derangement of the health. The returns of artificial appetite, or faintness and craving for food, I attribute to morbid secretions in the stomach, called on to the redoubled exercise of its functions, to make up in *quantity* of product for the badness of *quality*. Repair must be accomplished any how, and at any expense—if materials are faulty, so much the worse for the body. Hence this process is a rapid *ageing* of the body. Such people look prematurely old, broken up, and *wizzened*.

P.—I do not wonder at all this. Even simple hot water, too copiously and too frequently received into the stomach, must end, I should suppose, in debilitating its coats, perverting its secretion, and impairing nutrition. If the "*père de famille*" be knocked up, how will the children, depending on his daily, nay hourly, exertions, thrive? Well now, give me something of your experience and judgment on the philosophy of these tipples, of the justifiable and physiological uses of tea and coffee; of the part they may innocently, if not salutarily, play as meals, or, rather I should say, as parts of meals, vehicles for them, relishes and seasonings to them?

Dr.—*The danger or the benefit of any article of diet lies in the relation of its action to the state of the organism at the time of its reception.* To estimate the good or the evil that is in tea or coffee, *when* they are good or evil in any given case, this sound test or canon must be applied: the modifying conditions of the body must enter into the calculation. Whole nations are found to use these tipples *generally* with impunity (individual exceptions are of no account)—whole nations, in fact, to whom they are a necessary element of existence. Now let us interrogate the circumstances of those peoples—let us discover, if we can, the philosophy of those dietetic habitudes, whether they are not the guidance of true *instincts*, whether they have not an origin and basis in sound reason, and whether they are not real wants of civilization, the elements of progress. What you remarked of *instinct going before scientific discovery*, holds here pre-eminently.

Tea and coffee tipplers may be divided into two great classes, according to the quarters of the globe they inhabit. The first exists in hot climates. The other class belongs to cold, moist, variable, or malarious climates. Although the outward or climatorial influences, the habits and customs, of these two classes of people are so opposite, yet the effects on the organism are very nearly identical, at least equivalent. In the one case, the skin is over-excited; in the other, it is not excited enough. The result in either case is *a want of equilibrium* between the internal and external surfaces, and the vital actions taking place in them. In the hot climate, the organic powers are unduly tasked to supply the constantly exhausting drain from the surface. Of course the extravagant waste of one organ can only be kept up by robbing the rest of their due share. Hence the upsetting of the physiological balance of the body, and the creation of factitious wants.

On the other hand, the effect of bleak, variable, moist, or malarious climates is to check or repel the cutaneous circulation and exhalation, and thus unduly to congest the interior viscera. *Now the functions of an organ are equally impeded by an excess of blood or by its deficiency.* Hence the Dutchman or the Englishman, in their dense loaded atmospheres, have to fight against the same sluggishness and inertia of their vital viscera, that prompt the Turk or the Chinese to resort to the stimulus of coffee or tea.

P.—It is not to me at all wonderful, then, that when chance (or Providence) threw in the way of the former the genial beverages of the latter, that they should grapple them to their souls as great treasures found. In fact, it only wants the test of experience, the experience of their exact adaptation to a felt want of society, to produce the increasing popularity they have enjoyed from their first introduction until now.

Dr.—In this way, to use the phrase you have given me, the *dietetic habits and instincts of people anticipate the march of scientific truth.* In this way, *they are justified by the teachings of philosophy.*

But I was going to remark, in the case of the Hollander and the Englishman, and the American, if you like, there is an additional disturbing element called into play—an element that powerfully drafts off to remote quarters the vital energy that should be reserved for the purely vital or organic processes. *They are a commercial people. They live in their brains. Mental excitement*, partly the result of diet, and partly the result of temperament, and partly the result of the success that always attends energy and industry, *is the congenial element of all, from the merchant-prince at the Bank or Mansion House* to the anxious seller of oysters and oranges in the bustling streets. This is only maintained at the expense of the organs of supply. Hence these organs, compelled to work at disadvantage, crave artificial help. "Go ahead," is the universal cry, and maxim, and effort. The head is truly the *boiler*, and the stomach the furnace. "To keep the steam up" at high pressure rate, *fuel* is heaped on in proportion, often even to the *bursting* point.

P.—I see it all. It must needs be, that organs of which so much is exacted, and which are compelled to work at so great disadvantages, *should crave artificial help.* The social influences come to complete the measure of the evils of climate.

Dr.—You perceive then, clearly, how indispensably necessary

a counteractive is to this loss of equilibrium in the living organs. How instinctively men crave it, although not knowing its why or wherefore. In hot climates, for the stomachs enervated by drenching perspirations, strong condiments, spices, tea, and coffee, are necessary to bring them up to the *par* of proper action and its consequent comfortable feeling. Among the more northern peoples, and with more complex influences at work, in their case, to destroy the organic equilibrium, a co-equal want exists, and equivalent counteractives are demanded. The skin soliciting means to react against the repercussive influences of climate, the central powers sluggishly performing their functions, the pressure of the repelled fluids of the surface, and under the disadvantage of over-work of brain and under-work of limb, or the reverse, exact imperiously a stimulus something greater than simple food or simple water confers. *Quantity* is much less in the question of the ingesta than *quality*, and necessarily so by all the rules of physiology and philosophy. Here again the *instincts* of the people, unfailing, suggest the remedy, and *drive them to it*. In lieu of the aromatic stimulants their soil and climate refuse them, and which serve the purpose of the Southerns and Orientals, they have excogitated and elaborated their own indigenous drinks, ale, beer, cyder, spirits, wine, and brandy. In these, I know, much deplorable *abuse* takes place, great excesses are committed, much brutality and disease engendered. But this abuse does not affect my argument, which is to show the sort of thing, this *stimulating quality in the ingesta*, which the uncontrollable necessity of circumstances forces them to crave, and to solace themselves withal. But, as I before showed, as in the "flowing bowl" lurks a *fatal fascination*, continually tempting to transgress the *salutary limit*, those who have broken free of the *enchanter's spell*, and who wish by their example to save the liquor-bewitched, magnanimously agree to renounce the dangerous potations altogether, and substitute for them the more refined and civilising tipples of tea and coffee.

P.—All this is highly interesting. You present to me clearly, and in a new point of view, the *philosophy of tipples*. Exhilarating beverages are integral parts of our civilisation. In every step of his progress from barbarism, man taxes his ingenuity to meet the wants of this instinct of his nature. It was a matter of course that he should commit sad blunders, and entail on himself sadder disasters, by evoking a *spirit* which he could not *lay*,

creating *fire* which he knew not how to handle without burning himself. No wonder that tea and coffee are such popular tipples, for *their* cup is privileged against the pestiferous breath of the "foul fiend." "Long may they flourish, as a real blessing to mothers, fathers, and generations to come."

Dr.—Yes; the Lord be praised! tea tipple or coffee tipple is the *desideratum* of a refined and regenerate, or *regenerating* society. It is "a cup that cheers but not inebriates." Its excess may indeed develope nervous sensibility; but it never brutalises, never sacrifices individuals, never desolates homes, as alcoholic excesses so frequently do. If in some tea and coffee tipplers, the muscular system is not predominant, the fault is to be laid, not to the potation, but to the want of exercise, to the undue cultivation of the mental, to the neglect of the physical powers. *Without tea*, the same *régime* of life would produce the same results. There *are* tea and coffee bibbers who are well developed muscularly. To the labouring man, the sportsman, the trained fighter and runner, the soldier, their daily ration of tea and coffee, morning and evening, is indispensable. Tea and coffee tipples never produce gastritis, or hepatitis, or granular kidney, or gravel, or stone. Hazlitt was assuredly the slave of his tea-pot. But other things killed him. Had Franklin taken tea or coffee every morning for breakfast, instead of his heating nitrogenous mess of greasy gruel, he might have lived, perhaps, fifteen or twenty years longer. It would, in all probability, have prevented the formation of the fatal calculus that embittered and prematurely closed his otherwise green old age. If it would not have prevented the lithic deposit, *it would at least have washed it away while in the state of gravel.* Coffee tippling did not certainly shorten the days of Fontenelle, Voltaire, Deslisle, and other notabilities, who even went to excess in it.

P.—You said a little ago, that tea and coffee tipples were not advisable for every case and constitution.

Dr.—Well, I think I thereby showed my caution and discrimination. I will prove to you that I am not a "thick and thin" partizan of tea and coffee, or of anything particularly. I do not indiscriminately recommend tea and coffee as suitable for all people. Very far from it. Though I contend for the *principle* of these tipples *for the masses*, as meeting a want of civilisation, as a necessary element and phase of man's moral and physical being, yet the *practice* of them is a different matter when we de-

scend *to individual cases, and these cases made singular and exceptional by idiosyncrasy, by disease, or by tendencies to disease.*

P.—For whom then would you *pre*scribe, and to whom would you *pro*scribe these tipples?

Dr.—I would advise them to those of languid, lymphatic, cachectic, or inert constitutions; to the chlorotic and thin-blooded; to the catarrhal and the rheumatic; to the old and the infirm; to pregnant women often; to the constipated and to the flatulent; to those whose digestion is slow and laborious; and to those who live much on fat, oily, farinaceous, or mucilaginous food; after the abuse of spirituous liquors; during periods of watching; whenever drenching perspirations exhaust the skin and enervate the stomach, and, finally, wherever fogs or miasms, prevailing in the atmosphere, operate in a different way to destroy the tone of skin and stomach.

P.—Who are those to whom you would proscribe tea and coffee?

Dr.—To all abnormally sensitive persons, to the irritable, the nervous, the bilious, the hypochondriac, the hæmorrhoidal, the gouty, the plethoric, the apoplectic—to all, in short, the subjects of chronic *gastritis*, which is, perhaps, the real and the greatest source of the evil, in that immense multitude constituting the victims of the maladies. This you will admit is eliminating a very large class from the privilege of tea and coffee tippling, *some* will think me too *generous* in awarding. They cannot say, however, that I am indiscriminate in my award. A sound medical practitioner, imbued with proper sympathy for science and humanity, should have no *partizanship, nor should cherish any party passions.* For myself, I must be neither tee-totaller, nor vegetarian, nor anything *exclusive;* for then I must often sacrifice my patient to these miscalled principles, to be consistent being inhumane. *A bas* your isms at this price. There is incalculable good in tee-totalism, and there is virtue in moderation; there is immense advantage for some constitutions in vegetarian diet at intervals; and there is health and vigour for many ailing and weakly in prime beef and mutton. Extreme opinions ill become the practitioner who should be able to sift the chaff which the one-sided or over-zealous advocates of new opinions, or partial truths, are sure to mix so copiously with their wheat.

P.—But will not some of your *simple and pure dietarians* object that tea and coffee tipples make a man's pulse beat a little quicker than twice a day?

Dr.—What if they do, and if that be the fact? I know it to be *a counter fact*, that a stomachful of *pure* vegetable food accelerates the pulse *a great deal more and for a much longer time*, than a tea or coffee repast. But fully admitting this to be the fact, that these tipples *slightly* accelerate the circulation (for this is really much less than is usually believed), what is this when weighed in the scale against all their physical, social, and intellectual benefits?

P.—To finish this long conversation, please to give me your final estimate of the dietetic virtue and value of tea and coffee.

Dr.—A light sweetened infusion of tea or coffee can scarcely be called an aliment, although not destitute of nutritive materials. Tea or coffee is not taken *per se* to appease hunger, although for a time it may blunt or silence its cravings. Even the richest soups in this way will nourish only very partially, and for a very short time. A meal, with a view to nourishment, must contain materials in more or less solid form. Something for the stomach to seize hold on, to distend its coats, to provoke its contractions and its secretions withal. Again, many alimentary principles are not nutritive in themselves, which, nevertheless, are causes of nourishment in other things; they fulfil conditions essential to digestion. Whatever makes a food savoury and relishable, may by a clear title be called nutritive. For relished food, *cæteris paribus*, is better digested. That which is not relished, that which is repugnant to any sense, is not so easily digested; and this by a sure law, of which the instinct that has been violated is the exponent and representative. Ozmazome in meat is not *per se* nutritive; but as communicating an intense relish to what otherwise would be insipid, it is an evident cause of nourishment to the body. Tea and coffee, if you like it, are the ozmazome of farinaceous meals. Butter and bread are at all times delicious to the healthy man; but it is doubly so with the condiment of tea or coffee. In this way contributing an exquisite relish to what is eaten with them, they unquestionably contribute to the digestion and assimilation of the meal. This, you will admit, is to put in a high plea for their use. If bread and beef, or mutton, are, as I consider them, the two true *staves of life*, a cup of good tea and coffee with them is the *ne plus ultra* of diet to sustain a mortal in his labours, whether they be those of the head or of the limbs.

The tea vase and coffee pot are equally elegant and companionable culinary utensils; they are, in their way, a sort of *lares* and *penates*, at whose shrines we offer our morning and evening orisons, and under whose cheering auspices we enjoy some of our most delectable hours. They are great qualifiers of dry, indigestible, insipid, or salted food; diluting the one, and seasoning the other. For the soldier in camp or on the march, in barrack or in battle; for the sailor at sea, or the traveller by land; for the father with his wife and chicks, the moping student in his cell, or the lonely "single man" in his "apartments;" for the merchant at his desk, or the trader at his counter; for the *man of thoughts*—the philosopher, the poet, the artist—in the quiet seclusion of his study; and for the *man of words*, in the hot arena of public contention,—tea and coffee are tipples indispensable—to the one to give a relish to cheerless solitary meals—to all to prepare them for their labours, or to solace after them. These friendly beverages make most men oblivious, for the time being, of the worry and pother, the disappointments and vexations, the headaches and heartaches, that mark life's experience, and constitute life's discipline. If at any meal, it is at the tea-meal, that the heart is warmed, the affections expanded, the disposition softened, that the purest reciprocities of friendship are interchanged, and the gushing confidences of woman to woman, and friendly conversations of man with man, are poured forth. Under the fragrant steam of the tea-pot or coffee-jug, who ever cares for the east wind howling without, who ever complains of cheerless days or dreary nights? With all classes, and in all places, however heavy time may hang, however dismal external nature, however ruinous public affairs, whenever tea or coffee is introduced, if a man has any sentiment, then a truce is given to all sombre and diabolical thoughts, for the time being at least, the dull pace of time is accelerated, the gloom of nature is enlivened, and the confusion of the political or commercial world less confounded.

For the old, these tipples are the *cordials par excellence*. Their stimulus suits exactly the declining energy of their functions. If they be little nutritive in themselves, the demand for nourishment at that age is little. At all events, they serve temporarily to invigorate and enliven, to wind up the falling weight of their mechanism. They awaken their drowsy sensibilities; they rouse their torpid sympathies; they bind tighter for the time the gradually loosening ties of connexion between the organic and animal powers.

They recall for the occasion the pleasant consciousness of young life, and spread a spontaneous sunshine on the gloom of nature's decay.

CONVERSATION FIFTY-SEVENTH.

Fermented and Distilled Liquors.

PATIENT.—Is alcohol an alimentary principle?

DOCTOR.—Most decidedly not. It does not contribute to the formation or renovation of tissues. It is deficient in the necessary materials, nitrogen, sulphur, phosphorus, salts, &c. Liebig contends that it is an element of respiration—an animal *fuel* that is burnt in the lungs, and thereby converted into carbonic acid and water; the caloric evolved by which oxidation serves to assist in the maintenance of the temperature of the body.

P.—But do you not think this an obnoxious fuel?

DR.—Undoubtedly, one always, in my opinion, to be avoided, when better fuels are to be had. It is one that, when taken in the least *undue measure*, and *in unfitting circumstances*, does, and must do, immense mischief to the organism, before it is finally eliminated, in whatever modes, by whatever outlets. We know that, like all fluids, it is absorbed very rapidly from the stomach; and in proportion as it is undiluted and in excess, it goes coursing along the vital channels, *literally setting the system on fire.*

P.—I do not expect you to give me any detailed account of the various distilled and fermented liquors, as brandy, whiskey, rum, wines, cyder, perry, mead, porter, stout, ale, liqueurs, "compounds," &c. I shall be quite satisfied with knowing the chemical composition and physiological or pathological action of some of them. What are those of brandy, for example?

DR.—Its constituents are, water, alcohol, volatile oil, acetic acid, a trace of æranthic ether, colouring matter, and tannin. The relative proportions you will perceive on referring to Table No. 4. Alcohol, as you know, is a product of the vinous fermentation.

Rectified spirit of wine, its most concentrated form, contains about ninety per cent. of alcohol. Ardent spirits are obtained by distillation from vinous liquids.

P.—How would you define malt liquors; or what are their characteristics?

Dr.—They are *heady* (fermented) infusions of malt made *hearty* (bitter) with hops. Their principal constituents are, water and alcohol, sugar, gum, extractive, aromatic, and bitter matters, fatty and glutinous matters, lactic and carbonic acids, with salts.

P.—What is the average per centage of alcohol in malt liquors?

Dr.—Common beer contains about *one per cent.;* strong ales, *four per cent.;* best porter and stout, about *six per cent.;* the strongest ale, *eight per cent.*

P.—Pray what is the operation of malt liquors on the animal economy?

Dr.—Next to water, but far inferior to it, they perhaps best quench thirst. They stimulate the nervous system, or "exhilarate the spirits," in consequence of their alcoholic constituent. They aid digestion *in some cases* by the extrication of their carbonic acid in the stomach, and by the stimulation of the gastric mucous membrane. They are slighly nutrient, directly and indirectly, directly by their sugar, fatty, and extractive matters—indirectly by the aid they afford to digestion. All this I affirm and with great limitations, of the best malt liquors, genuine home-brewed. But when you consider the *extension* and *systematic* adulteration of those liquors, their use indeed becomes very restricted to the man who is to be guided in his dietetic habits by the sound dictates of physiology.

P.—What are those sophistications you allude to?

Dr.—*Cocculus Indicus*, for example, a very poisonous fruit, is largely used to increase the intoxicating quality of the liquor. Quassia also, and *tobacco*, grains of paradise, cayenne, sulphate of iron (green vitriol), alum, and common salt, are common admixtures. These ingredients are used because of the *bitterness*, or *flavour*, or *colour*, or *consistence*, or *froth*, they impart.

P.—What are the chemical constituents of wine?

Dr.— Water, alcohol, sugar, gum, extractive matters, gluten (which exists perhaps in white wine only), acetic acid, bitartrate of potash (that which constitutes the *crust* or *beeswing*), tartrate of potash, and alumina (an ingredient predominant in German wines), sulphate of potash, chlorides of potassium and sodium,

tannin, colouring matter of the husk (in red wines), carbonic acid (in champagne and effervescent wines).

P.—On what does the *bouquet* or flavour of wine depend?

Dr.—On the presence of a volatile principle generated during the process of vinous fermentation. It has some connexion with the acid of the wines, for they always co-exist. The *aroma* is in the wines of hot climates. In the Rhenish wines, which contain an extra proportion of tartaric acid, the *bouquet* is very agreeable.

P.—On what do the infinite varieties of wine depend?

Dr.—On as varied circumstances—as, difference of grape, soil, site, season, culture, peculiarities of process and preparation, time of vintage, age, the vessels and places wherein kept, &c.

P.—I am very desirous of now hearing your exposition of the effects and *modus operandi* of alcohol on the human body, in various doses, from the habitually moderate to the immediately poisonous, or fatal. The *use* of alcoholic liquors, seems to me a very puzzling problem; for I am quite aware that their *abuse* is a prolific source of much of the physical, mental, and moral degradation of the masses of mankind. *Data* to guide my judgment in this most important *practical* question of every day life, would be to me of infinite consequence; and I hope and believe that such will be elicited in the course of this conversation. Will you be so good as to explain to me, then, in the first place, the principal morbid changes alcoholic liquors produce on the animal fabric?

Dr.—Most gladly do I accede to your request. Animal structures have their simply *physical*, purely *chemical*, and mysteriously *vital properties*. I shall show you what alterations alcohol effects on each of these three—to treat the subject systematically.

1st. As regards the simply *physical* properties of the tissues, alcohol has a remarkably *corrugating* effect—the texture *shrinks*. This is explained satisfactorily by the much less amount of alcohol than of water they absorb. Hence when alcohol is mixed with water, as it always is, a larger quantity of water is expelled, that is, one drop of alcohol in a structure displaces so many drops of water. Hence the texture is drier, shrunk. This shrivelling is increased by the coagulating effect of alcohol on the soluble albumen the tissues contain.

P.—Of course these effects will vary according to the concentration of the alcohol, or the amount of it taken?

Dr.—Precisely so, and these effects *tell* most on the coats of

the stomach and of the blood-vessels, wherein the irritant is first received, absorbed, and circulates. This must necessarily alter the *chemical* properties and actions of the parts affected. Alcohol, for example, darkens arterial blood.

P.—It stands to sense, that the substitution of anything else for water, must produce a decided change in the chemical nature and reactions of the tissues, as well as in the circulating fluids themselves.

Dr.—Well. Of these the most important is the coagulation of the soluble albumen. But, ordinarily, alcoholic drinks do not introduce the spirit in a sufficiently concentrated dose for this effect to be very palpable. Nevertheless, it must *tell* more or less—it *must* modify the conversion of the albumen into *fibrine*—a stage more advanced in the process of *vitalisation*, or structure-building.

P.—Clearly, the *organisability* of the fibrine, as you before explained it, will be impaired?

Dr.—Yes; and as this property of fibrine is the basis of all the nutritive operations, they must be correspondingly impaired; in other words, *structure will be mal-elaborated*, will be *below par* in quality. Hence the individual will display less vigour than otherwise his amount of nourishment was calculated to produce, and would have produced.

If I were to give you in one word what the action of alcohol is on the living tissues, I should say it is that of an *escharotic—a diluted caustic.* This is its true and justifiable idea. Applied concentrated to a tender vascular surface, as the skin and mucous membrane, it determines all the symptoms of inflammation—heat, pain, redness, swelling. Diluted, as in our liquors, it produces of course simple *irritation;* but the transition from this irritation to *inflammation* is only a question of the amount of the stimulation, the degree of its concentration, or of the time of its application.

P.—I remember in your discourse on the action of the capillaries, you spoke of the influence of alcohol on the circulation of the frog's web?

Dr.—Quite *apropos.* It was there shown that dilute alcohol first *quickens* the circulation and *contracts* the vessel; but by-and-bye the circulation becomes *retarded*, and the vessels *dilated.* With alcohol more concentrated, the blood is *at once retarded*, and its vessels *dilated.*

P.—I infer from this, *that the vital action of the tissue is exalted, only to be speedily and proportionably depressed*, and that

if the stimulant be in very strong dose, the quickening action is merged in the entire prostration, or rather exhaustion of the energy of the tissue?

DR.—Perfectly true and just.

P.—Alcohol, being a *stimulant*, is it then a tonic? or rather, let me first ask you, what a *tonic* is?

DR.—I should define a tonic to be that which permanently increases the vital contractility of the living solids in general, and of the walls of the blood-vessels in particular. In this view, tea and coffee, in certain cases, have a clear claim to the name and the virtue of *tonics*. But it is equally clear, that the supposed tonic properties of alcoholic liquors are, in reality, only *stimulant effects*. They produce a temporary excitement of nervous power.

P.—Will you describe the general effects of alcohol on the system?

DR.—They are those of *poisoning*, as its name indicates—intoxication. The phenomena of this state I need not describe, further than to particularise its *three stages*. First, there is a general exaltation of all the functions. The pulse augments in force and frequency; the secretions are increased; so also appetite and digestion; the animal nervous centres are especially acted on; the intellect is brightened, the speech more fluent, the countenance, voice, eyes, and gestures, all more animated, and the spirits more exhilarated. The symptoms, in fact, are those of incipient brain-fever. There is perversion as well as exaltation of mental power. The voluntary control over the current of the thoughts is weakened. In the *second stage*, there is disturbance of the SENSORY GANGLIA—the apparatus of thought and of the senses. In the *third stage*, the functions of the medulla oblongata and spinal chord are affected. *Coma*, or profound insensibility, characterises it. There is deficient respiration, tetanic spasms, squinting, dilated pupil, &c.; in fatal cases, asphyxia, failure of respiration and circulation. Venous blood is in the arteries.

P.—How do you explain the *modus operandi* of this poisoning process?

DR.—It is not difficult. Alcohol is rapidly absorbed into the vascular system. In experiments, the blood is found strongly impregnated with alcohol. But independent of this absorption and its effects, it primarily and principally affects the *nervous centres*. Indeed, when received in a large dose, or concentrated form, into

the stomach, the violent impression thus made on the gastric and sympathetic nerves, is equivalent to a blow or stroke on the epigastrium or the pit of the stomach, or a dose of hydrocyanic acid, it depresses the heart's action, even to its suspension by syncope. Of course, in the ordinary process of intoxication, these effects are gradually superinduced.

P.—What are the general effects of small doses of alcoholic liquors?

Dr.—In any case they quicken the circulation. With the digestive process, there is a normal acceleration of the pulse dependent on the augmented supply of blood to the digestive viscera at that time. But independently of this, an extra activity given to the circulation daily, and repeated often, two or three times a day, through a long series of years, cannot occur without more or less compromising the vital interests. All abnormal acceleration tends to produce local congestions, when the stimulating cause no longer operates. There is collapse of the excited, perhaps exhausted, vessels, a relaxation of their tissues, a sluggishness of their circulation. A part habitually over active (as the brain) has its circulation disproportionately excited by the ingestion of food or alcoholic liquor. Hence, flushed face, heat, tension, and headache is frequent after meals. These local congestions dispose to general irregularities of the circulation. A torpid liver will congest or stagnate the whole circulation of the chylopietic viscera. A dyspeptic stomach cannot have its circulation abnormally and unnecessarily excited, and that systematically, without having its morbid tendencies confirmed and aggravated.

The stimulating effect of alcohol on the nervous system, induces great power of over-exertion for the time, with unconsciousness of the abuse of the strength being over-tasked. Hence, the excessive "tear and wear" of the frame and its early break up in individuals and communities kept alive by such excitement. The perverted nutrition of the tippler is a great element in his abnormal wear and tear.

P.—I suppose the man who lives *physiologically*—who conforms his habits and mode of life to all the organic laws, cannot far transgress without being promptly brought to a stand, and warned by the failure of his corporeal or mental energies, that he is overtasking them?

Dr.—He cannot. Failure of power to digest that which is really needful for repair of waste, is sure to pull him up. Rest

and change suffice for his renovation. But the case is very different if these efforts have been sustained for years on the strength of alcoholic liquors. *Timely* notice is neither given nor taken. The exhaustion is complete, often irremediable, in proportion to the excessive expenditure.

P.—What is the effect of the habitual "temperate" use of alcoholic liquors?

Dr.—The first great evil, as I take it, of this "moderate" but factitious stimulation of the organism, is the production of artificial appetite and artificial digestion. The daily introduction of more nutrient materials than the real wants of the economy demand, and beyond what its powers can properly dispose of. The ultimate effect is disease, shown in some by plethora (fulness of blood); the efforts of nature to relieve, which ends in, or disposes to, local congestions, inflammations, and hæmorrhage. In others, this superfluous food is perhaps never even digested, or but partially so, and diarrhœa, less or more, relieves the system of it; at all events, it never goes further than the circulation, is never assimilated, but presses a burden on the excretory outlets, which are ever irritated by the constant determination of blood to them, which are over-tasked, over-strained, prematurely *used up* in short, by the effort of their constant elimination. Hence, in temperate climates, the frequency of chronic diseases of all sorts, bilious and "dyspeptic" disorders, kidney affections, &c., loss of appetite and digestive vigour with advancing years, premature old age. In temperate climates, excretory activity of the lungs is made to compensate in part the inactivity of the skin. This pulmonary exhalation, is exceedingly liable to be interfered with, and temporally checked by over-cold, damp, or variable weather. Hence, in my opinion, one great source of the liability to consumption of the people of such climates. But "moderate" tippling tells most in the decline of years, when the excretories get knocked up; the safety valves worn out, or unworkable. In hot climates, the exhalation by the lungs is comparatively scanty. The duty of eliminating the non-azotised matters falls chiefly on the liver. Hence, the frequency of its disorders among Europeans, whose diet is *too* "heavy." The azotised elements are eliminated by the skin and kidneys. In hot climates, putting the speedy fatality of habitual excesses out of the question, even the moderate glass is doubly injurious, because alcohol there is more exciting, and all the causes of disease act with redoubled intensity. What is a

remote consequence in a cold climate, becomes there almost an immediate consequence.

P.—Can you explain the specific action of alcohol in the nervous centres?

Dr.—Not otherwise than that, in consequence of some specific relation or peculiar affinity that exists between alcohol and nervous matter, alcohol is drawn to the nervous centres, where its presence must modify their nutrition. All *poisons* have thus their specific affinities with specific textures, in other words, *they tend to localize themselves* in particular structures. Thus the seat of election of the medical poison, strychnine, is the spinal chord, of digitalis the heart, of cantharides the bladder, of mercury and iodine glandular structures, &c. &c. So of alcohol, the brain is first affected, the psychical changes preceding the sensatory, or the motory.

P.—How is alcohol eliminated from the system?

Dr.—By the lungs, kidneys, and skin; but it is principally carried off by the combustive process. It is oxydised at the expense of withdrawing the oxygen from other substances which should be eliminated, and whose undue detention darkens, deteriorates, and diseases the blood.

P.—Will you come now to speak of the diseases produced directly or indirectly by alcohol?

Dr.—That is a long and highly interesting topic of discourse. We shall resume it in our next.

CONVERSATION FIFTY-EIGHTH.

Doctor.—Alcohol, as we might expect, primarily and specially deranges *the nervous system*, whether most the *cerebral centres*, as is seen in the lesions of intelligence, or most the abdominal ganglionic centres, as is seen in perversions of nutrition, it is hard to say.

Patient.—*Delirium tremens*, I presume, is reckoned in the foremost rank of the brain lesions of drunkards.

Dr.—And justly, if you add stomach lesions. Of course I can-

not enter into the history of these diseases on the present occasion. *Insanity* is a still more frequent cerebral derangement produced by alcoholic liquors, sometimes among the middle classes, even in doses (drams) called "moderate" or "temperate," and especially among the lower class from excess. In both these diseased conditions, I suspect that derangement of the abdominal ganglia first exists, perverting the nutrition of the fabric, and thus rendering it easily affected by causes, which in the state of health would be inoperative. From the same disordered nutrition of the cerebral nervous centres arise, no doubt, its inflammatory diseases, to which alcoholic tipplers are so subject, viz., apoplexy, palsy, epilepsy, liver and kidney diseases, dropsy, &c.

P.—I suppose the premature decline of mental vigour and of muscular energy, so frequently met with among "temperate" drinkers, (*soi-disant*), arise from the same sure law of *cause* and *effect*, although here slow and insidious, from the more gradual and imperceptible injury produced by the well disguised and well guarded dose?

Dr.—Just so. In such cases, the payment of nature's debts is only postponed. The observance of the organic laws in the *majority* of instances, or generally, will neutralize for long, but it cannot avert eventually, the effects of departure from those laws in the *minority* of instances, or only exceptionally. This may be extended and set down as an incontrovertible moral axiom.

P.—So that physiology assumes even a higher function than a teacher of physical truth: it is a preacher of righteousness. It inculcates moral as well as material lessons—*that there is no impunity to transgression—cannot be in the dominion, government, and settled laws of the Omnipotent and All-merciful.*

Dr.—Truly, there *cannot be.* One of the greatest mischiefs that alcoholic liquors inflict, is that, by the temporary stimulation they afford, they nerve to the endurance of greater efforts than are compatible with permanent health, they mask the mischief for the time being by the factitious energy induced, giving to the unreflecting culprit an apparent, but alas, deceptious feeling of immunity, which blindly urges him to persevere in his wrong course, till nature will no longer, *by any means*, be coaxed to forego her rights, and endure the breaches of her laws.

P.—I expect you have much to say, and much that is interesting to say, of the diseases of the alimentary canal induced by alcoholic drinks.

Dr.—I have, I promise you, in time and place. But here *very briefly*. These diseases arise by a sort of two-fold causation. In the first place, by the general impairment of the nutritive processes and their results, in consequence of the constant presence of an ungenial, unconformable foreign substance (alcohol) in the circulating current; and, secondly, by the direct irritation of the imbibed poison in the mucous membranes. For what the latter is, you have only to refer to Dr. Beaumont's description of the interior of San Martin's stomach after a few days of drinking. This state of the intestinal, may be summed up in the expressions *tenderness, soreness, redness, ulceration, hæmorrhages;* a pathological condition evidently indicating or resulting from an insufficient plasticity of the blood, on the one hand, and a softened state of its vessels, on the other.

P.—Do you assign this, as the cause of the proverbial dyspepsia of moderate drinkers?

Dr.—I think it is the most likely *rationale* of their "bad stomachs;" although habit blunts the susceptibility of the mucous membranes, it only nevertheless *delays*, does not annul the consequences. Protracted, continuous, "temperate" tippling, is undoubtedly the cause of that extensively and permanently vitiated nutrition, which ends in premature decline of the functions and break-up of the organism.

P.—Drunkards, I believe, are peculiarly liable to diseases of the liver, ending in incurable dropsy. Will you explain how this arises?

Dr.—The blood from the gastric veins immediately discharges itself into the liver. If more or less charged with alcohol, of course, it must proportionably stimulate the liver, at the same time augmenting and vitiating its secretion. *Alcohol has been detected in bile.* But this, although great, is far from being the chief source of injury to the liver. This comes from its being forced to supplement the duty of the lungs. In other words, the liver is over-worked by being called on, in these cases, to eliminate the surplus of hydrocarbonaceous matters accumulated in the system, through the alcohol in the blood appropriating the oxygen that would otherwise have united with these matters, thus burning them up, developing fresh animal heat through such combustion, and discharging the resultant *smoke* and *ashes* through the chimney of the lungs in the shape of carbonic acid and vapour.

P.—This is a very intelligible *rationale* of the frequency of

acute and chronic diseases of the liver in the intemperate—especially when taken in connexion with what you have said before on the balance of the functions of the skin, lungs, and liver, as upset by dietetic excesses, irregularities, and notably in hot climates and seasons. But are not the *kidneys* also largely predisposed to morbid action, or alteration of structure, in tipplers?

Dr.—They are, and reasonably, from the increased action they are subject to, through the special determination of blood to them, excited by stimulant liquors, and their attempts to eliminate the poison. I referred to the tendency of alcohol to coagulate the soluble albumen of the blood. In such case, if it be set free in the circulating current, the only available vent for it will be the kidneys. Hence we find *albumenuria* (or granular kidney), a disease *par excellence* of drunkards, with diseased stomach and liver—its characteristic being the discharge of albumen through that outlet of the body.

P.—Is this albuminous renal discharge, the cause or the consequence of the granular kidney?

Dr.—That question deponent answereth not, it being still *sub judice*. I should say, however, that the irritation of such a substance and the labour of its elimination would, in some measure, explain the inflammation and subsequent degradation of the structure of the kidneys.

Imperfect function of the kidneys, their becoming morbid under habitual excitement, or the labour of elimination imposed upon them, is the great element in the production of gout and rheumatism—diseases of the heart and arteries. These diseases are the prevalent complaints of declining years; because excesses of diet in the period of corporeal growth, or in the active waste in the bustling period of life's maturity, are counteracted by the activity of the excretory outlets. But with increasing years this apparatus fails, and just in proportion as it has previously been overtasked, and the necessary result of that failure of function is morbid accumulation in the blood.

P.—Well. I suppose the general result of the "knocking up" one by one of the purifiers of the blood is notably to impair the nutritive operations, and to degenerate the entire tissues of the body?

Dr.—A sound conclusion, borne out by the fact. Nutrition is neither so perfect, nor so prompt, in the habitual tippler, as in the water-drinker. How can this be, when, besides the "dead-lock"

of the liver and kidneys, the old and wasted constituents of the body are debarred their pulmonary outlet by the alcohol of the blood absorbing the oxygen intended for their elimination? Hence the lowered plasticity of the fibrine of such patients, the shrunk state of their blood corpuscles, their flabby tissues, their unweildly bodies, *their diminished power of sustaining injuries*, and their proneness to fall the first victims to epidemic visitations.

P.—Alcoholic liquors, thus deteriorating and embarrassing the play of the vital functions, more slowly or rapidly according to the kind and quantity used, must proportionably curtail the duration of life?

Dr.—It does, most unquestionably. How much, how riskful are such lives, is proved by the fact that no insurance company will insure a person of intemperate habits. The statistics of the army in India in recent times show that the mortality is in the ratio of intemperance.

P.—But your views of the nature and operation of alcoholic liquors do not go to the length of proscribing them altogether. Independently of their *medicinal* use in actual disease, I suppose you would recommend them occasionally when severe exertions of body or mind were called for; or when great heat or cold was to be endured; or when contagion was to be resisted?

Dr.—A question I have been often asked. Of the due administration of alcoholic stimulants in disease—one of the most difficult problems in the whole range of practical medicine—I shall try to explain to you presently. But for the other occasions you name—occasions wherein popular feeling runs so much in favour of the sustaining or protective power of strong liquors, I believe, that they are totally illusive guarantees for the end desired, for substantial, enduring, and available strength and stamina. *They violate the two prime conditions of the energetic exercise of the corporeal functions.* First, they contain not, or only in very infinitesimal proportion, the materials to repair withal the waste of either muscular or nervous tissue. Secondly, they mar the oxidation of the products of decomposition, place an impediment to the elimination of the excrementitious *débris* of the system, by the oxygen that should combine with, burn up and remove the latter, being bootlessly appropriated by the alcohol instead. The retention of this effete matter is tantamount to so much poison in the system, and tends to ruin the *natural* tone of the nervous system. Alcohol in the blood tends to keep it of the venous character, that is, black and poisonous.

P.—It is evident, therefore, that the habitual use of alcoholic liquors is a draw-back, not an aid, to muscular and nervous power; but you will admit that a draught of intoxicating liquor will "get the steam up" temporarily for a great exertion?

Dr.—*Temporarily*, I admit, but not for a continuous effort. It is strength on a false bottom, corporeal ready cash raised on "false pretences," or by a ruinous mortgage. Nervous power now sinks as much *below par* as it was previously *above par*. The evanescent augmentation of the force, fulness, and frequency of the pulse, so induced, is a sort of delirious agitation of the organism nerved to great effort, while the elements of strength are withheld. It is the case of a steamer compelled to burn its own furniture and timbers, in the absence of fuel. How long can such a process last—how often be repeated? When you have used up all but the bare hulk, and are reduced to the water's edge, of what avails your steam so fed? Where shall the crew crowd to? Where is the accommodation of your passengers? Can mutiny be repressed under such circumstances? Can such a wreck hang together long? So it is precisely with the animal body, heated with false fire, consumed with its own fuel. It is decomposed, disintegrated, and ruined while yet in its prime; the gaily-rigged, well-equipped bark at morn, you find a floating wreck before eventide, and *this catastrophe too often in a calm sea.*

P.—Yes; you made this clear before in our physiological conversations—that the death, the decay, and renewal of the muscular and nervous structures, must all keep pace. And hence, if the materials of muscle and of nerve be not supplied to the organism, there must be a speedy limit to this factitious generation of power, the body eating up its own entrails, as it were, or as you have just now appropriately allegorised it in the steamer, fed with its own timbers.

Dr.—The worst of it is, that under these factitious efforts, the body is in so unnatural a state as to be insensible to the damage it is sustaining. Hence, long subsequent depression, and still longer recovery. Long after the point whereat the powers of endurance and repair have been exceeded, the furnace, fed with living fuel, keeps the human engine up to high-pressure work, all unconscious for the moment of the irreparable damage to the machinery that is being committed. Presently *the boiler bursts;* or, the safety-valves, by first getting clogged, give timely warning of the approaching catastrophe. And there is no alternative but to stop

and put into harbour, *if happily a harbour be at hand.* Water-cure establishments have been, and will be, harbours for crowds of such human wrecks; and I am happy to add, that such is our success, and the sound lessons of living and working we inculcate, that most are able again to set sail with fairer prospects for the rest of the voyage of life, if they are but observant of the lessons and the discipline taught.

P.—It is clear, then, that alcoholic "support" is fallacious, that severe continuous bodily labour is better sustained by the man in sound health, without than with intoxicating liquors, or any stimulating drinks.

Dr.—And this not merely in *theory*, but in actual practice. This is too important not to have been well tested by sufficient trials of strength between "teetotallers" and "temperate" drinkers. Popular prejudice, the alleged "universal experience" of mankind was long against this view. But it is a fallacy now exposed and scattered to the winds.

P.—Is not temperate drinking supposed by authors to favour mental exertion?

Dr.—This idea is quite as fallacious and ill-founded as that of its capability of increasing the power of physical exertion. Long ago I remember trying stimulants to assist me in scribbling. As the most *spirituel*, gin-and-water amongst others, but happily I soon found my mistake. One of the first English writers of the day finds smoking all but necessary during the hours of writing. The continued forth-putting of mind in proper condition depends on the same material conditions as maintain the integrity of the general nervous functions, that is, healthy nutrition and healthy excretion.

P.—You have proved clearly that these processes are not aided by alcohol, or any intoxicating mixture.

Dr.—It is easily done. I admit, indeed, as every one must, that fermented liquors temporarily excite mental activity, producing a transient flicker of the flame of genius, or sustaining effort in spite of exhaustion. But the depression of mental energy follows the undue excitement of it, precisely as with physical exertion. There is no true gain. Some works of *genius* have been thrown off under the inspiration of strong drink. Some men of *genius* have been notorious for such indulgences. *But there is a bitter compensation in the end.* The depression and *dereglement* of mind consequent on these intellectual debauches is a heavy

penalty. Besides alcoholic stimulus only answers for one kind of mental efforts—the flights of imagination, the sallies of wit, the utterances of morbid sensibilities, and the creations of the inventive faculties. But for labour, calling forth the purely ratiocinative powers, for exertions of intellect requiring concentrated attention, acute observation, and profound judgment, they are never found to answer. On the contrary, they cloud and confuse the faculties. Some of the most laborious literary men have been water-drinkers.

P.—Well, you will concede merit to alcohol as a fuel. The popular opinion of its protective power against cold is surely right, sanctioned as it is, I believe, by the authority of Liebig?

Dr.—Undoubtedly alcohol, in a chemical point of view, is a respiratory element, is a simple fuel, that is, it can be burnt off, so as to shield the system from its "untoward" effects. But this is saying the most for it. It is a very unadvisable and unsafe heat-producing material. One would hardly recommend fireworks as domestic or daily fuel, if better can be had. True, it affords a temporary resistance to severe cold, but it is *very temporary*, and nothing to compensate its injurious effects, in preventing or retarding the oxidation of those ingredients of venous blood needful every moment to be eliminated.

P.—But will not alcohol, if burnt up purely as a fuel, in that case act less, or little if at all, as a stimulant of the circulation and of the nervous power.

Dr.—I grant that this is *theoretically*, and perhaps sometimes *practically* plausible. But these are very exceptional cases. Alcohol is too strong a vital stimulant ever to be a safe or physiological *fuel*. For an habitual resort in that way it is out of the question. For resisting prolonged and intense cold it is far inferior to solid food: if this exposure be combined with severe muscular exertion, then the alcohol is *positively* injurious; fatigue more speedily ensues, and is more oppressive. If the exposure be but temporary, the factitious heat and energy it creates will for so long neutralise the depressing influence of the cold. The habitual spirit-drinker is of all others the most easily frozen to death. These assertions are established by a host of witnesses. The arctic voyagers were of all others placed in circumstances to test the value of alcohol as a fuel, and their testimony is all against it. In so much so, that spirit-rations are not now allowed in these expeditions.

P.—What would you say, then, was the natural or physiological fuel for keeping up the heat of our bodies?

Dr.—Fatty, starchy, and saccharine substances. These do not retard the chemical changes in the blood, and the excretion of its impure and wasted matters. By nature's provident arrangement, what is not expended is stored up in the body as a surplus for the first future exigency.

P.—I suppose the accommodating doctrine of alcoholic drinks keeping down extreme heat is of a piece with all the rest?

Dr.—If they best serve to warm the body, they cannot surely best avail to cool it. Their *modus operandi* is all against any such influence. If their secret lies in restoring the *watery* loss in perspiration, alcohol is surely of all things the most inappropriate substitute for *water*. In truth, alcoholic liquors are, in this case, only available as *stimulants*, and therefore noxious. The demand for heat-producing materials in warm as compared with cold climates—the respiratory process being less energetic, the amount of carbonic acid set free is much less. The beneficent provisions of Divine Providence for the inhabitants of the respective zones indicate an admirable adaptation to their wants in this way; the fatty, oily, high calorifiant diet of the north giving place towards the south to the farinaceous and saccharine aliments of lower calorifactive power.

In warm climates the excretion of the wasted, impure matters of the blood is too scanty to permit with impunity any check from a substance of the nature of alcohol, which tends still further to deteriorate the blood, and to load it with combustible elements. The stimulant effects of alcoholic liquors are more marked in warm climates, and less intoxicates. Exhaustion is rapid and severe in proportion. Hence in the inebriate in warm climates, the circulating current becomes early and deeply vitiated; the lungs, and even the skin, much duty as they do, prove inadequate for its purification. This extra work the liver for awhile is forced to undertake; but it soon succumbs and gets diseased from doing surplus duty.

P.—But it strikes me as at least very plausible that the stimulus of alcohol would afford a valid counteractive for the time against the weakening effects of perspiration.

Dr.—But I deny that *perspiration is* a weakening process at all. This is a grand mistake, I believe, both among the popular and the scientific world. Perspiration, *per se*, does not weaken. Provided simpler fluid be let in to repair the waste, no loss of

vigour is felt, and this by patients and others sweating freely every day, and for months together, with few intermissions. Fatigue will only follow labour. Perspiration is only the means of letting off the surplus heat of the body. With this fluid very little solid matter passes off, and none but excrementitious, or the wasted and not wanted. It is a simple oozing forth of so much water from the blood, which is easily re-supplied by absorption from the stomach. If sweating is such an injurious debilitating operation of the human system, in the name of common observation, then, how does a reaper, who sweats *eight hours a day*, last through "a season;" or a gentleman who rides hard three hours a day, perspiring profusely.* The water patient, when this natural derivative is indicated, and *ordered as a remedy* (which is by no means a matter of course) does not perspire perhaps in a month as much as the reaper does in a day The whole perspiration process, properly performed, with all "means and appliances to boot," is pre-eminently tonic and invigorating, an admirable *and invaluable revulsion* from the interior to the exterior. This thousands of water-cure patients will testify. The northern nations, as well as the Turks and Orientals generally, have recourse to the sweating-baths, for their refreshing, restorative, bracing qualities.

P.—How then do you explain that fatigue from muscular exertion in hot weather which everybody feels.

Dr.—I deny that it is always so. I know many, who are well, who can walk for hours in the hottest day of summer, *drenched in perspiration of course*, but with no more fatigue than if the journey had been performed in frost. If the transpiration and evaporation of fluid at the surface of the body be impeded, as by obstructive or saturated clothing, damp "muggy" atmosphere, &c., the cooling effect is lost, the heat of the body is retained, and with it excrementitious matters. In these circumstances weakness will be felt. I have no doubt that the feeling of fatigue from slight exertion is always accompanied more or less by retained excrementitious matters in the blood, and faulty action of the apparatus below the diaphragm.

P.—Or another case you will admit, the absence of nutrient elements in the blood when exertion is made on an empty stomach or too long after a fast.

* Mr. L—— has just told me that, with scrupulous care, he weighed immediately before and after having sweated freely for half an hour with the lamp, *followed by the bath*, and he had gained eleven ounces in weight—can you tell me why?

DR.—That admission I make only qualifiedly. With the weakly and sickly it may be so. But the strong man, who has fasted from dinner time the previous day, sixteen or eighteen hours, can without inconvenience, and light of foot too, walk his dozen miles before breakfast. The racer does his feats on an empty stomach. So beasts of prey are known to sustain almost incredible exertions after days of fasting. But the over-fed man or animal, whose blood is replete with excrementitious matters, for that reason solely, sinks under the smallest modicum of exertion. Let the same man or beast fast twenty-four hours, and so burn off their superfluities, they will then astonish you with the striking contrast of the efforts they can put forth. This is the secret of the water patient's run over hills before breakfast, the *luxury of the day*, as I have often heard the exertion called.

P.—In all this you suggest much to ponder on.

DR.—*And more to practise*, if people would only pick up hints where they are strewn thickly. I shall revert to this topic in speaking of the water processes.

P.—If this philosophy of yours be true (and I see no reason to question it), then the idea of supporting labour better in hot climates with alcoholic beverages is quite out of the question. The waste of the muscular tissue must be then greater than anywhere else, and therefore a greater accumulation in the blood of the excrementitious matters so generated. The prompt elimination of this is the question for the inhabitant of burning climes. But alcohol clearly bars the door of its exit, or at least indefinitely augments the amount of carbonaceous matter to be thrown off. I think I have caught your idea.

DR.—You have; make the most of it; it is replete with suggestions. But perhaps the worst of this alcoholic evil in hot climates remains to be told. Its stimulus of the digestive organs rouses them to an artificial craving for food, and to abnormal efforts to dispose of the excess taken under that guise. This over-action of the stomach is quite uncalled for; because a less supply of food, and a lighter kind, are necessary, the demand for combustible material being reduced to the very minimum. Indeed excess in diet, next to alcoholic abuses, are at once the most fatal sources of tropical diseases; and these two stand in the relation of cause and effect,—the alcoholic stimulation prompting the artificial appetite, and an equally artificial digestion filling the system with crude, unconformable fluids. In summer we have diminished appetite,

and our food should be both less in quantity and lighter in quality; otherwise an excess of excrementitious matters will be retained. These eventually force themselves a passage out of the system in bilious diarrhœa, common cholera morbus, &c.

P.—*Apropos* of cholera, what is your opinion of the protective power of "generous liquors" against such and other epidemic visitations?

Dr.—Illusive guarantees, all. I believe both the Profession and the public grossly wrong and deluded in the faith they put in this alleged conservative. Many facts, I know, *appear* to countenance the opinion. Suddenly withdraw his allowance from an habitual tippler, and place him in another Walcheren, and ten to one he will take the disease. But this proves nothing in behalf of the protective virtue of the strong drink; it rather speaks against it. The morbid depression then experienced, the *abattement* of body, and *découragement* of mind, would be circumstances highly favourable to the development of disease. If there be anything in the morning air, or the morning emptiness (as some suppose that predisposes the body to receive infection), then a substantial breakfast, or even a simple cup of coffee, is a much better prophylactic than the morning *dram*. The stimulus of the alcohol is all on a false bottom, as I said, or without any bottom at all. It must be again and again repeated, to *screw up the nerves* to goad on appetite, and produce temporary insusceptibility to morbific agencies. For the healthy man of regular habits, plain, sound diet is sufficient stimulus and protection. It introduces the true elements of vigour, due materials for the supply of waste and wear, due fuel for heat, and gives fulness and firmness to the pulse without fevering the blood.

P.—You hold, then, that the best protection against infection or miasm, as against cold, is the maintenance of the health of the body by every physiological agency, among which you reckon total abstinence from intoxicating liquors one item?

Dr.—I do. Plain diet and regular *régime*, in other respects, are an infinitely better protection than *dram drinking*. The abnormal depression that sooner or later supervenes on abnormal excitement, is the most powerful *predisposing cause* of malarious diseases. The habitually intemperate are the *first and readiest victims* of *fever*, *cholera*, *plague*, &c. The nutritive functions will work well if let alone, and will guarantee health well if their *sane* dictates are attended to. Why not, then, let them alone? This

over-stimulation by alcoholic liquors is dear and deadly. Their after effects are, indeed, often long in showing themselves, such is the resistance of some constitutions; and when they do appear, they are again and again *masked* by the reiterated dose of the stimulant. But the fund of vitality has its limits, and is unreplenishable; it cannot stand all these drains and ruinous loans; corporeal bankruptcy is at length inevitable. The hour of corporeal retribution can no longer be postponed; for it is the most certain of all truths, that the continued, although moderate, employment of alcoholic liquors, induces, sooner or later, a premature exhaustion of the vital powers.

P.—So that I may lay it down as a sure principle, that *in the most trying climates* and *circumstances, the most vigorous health is maintained and maintainable, without alcoholic stimulation?*

Dr.—Yes. That principle has been well tested by large bodies of individuals; by ships' crews in every part of the world; by armies in bivouac or on the march; by mechanics in their workshops; shopkeepers at their counters; merchants at their desks; and men of letters in their closets. Moreover, I affirm, that the habitual use of alcoholic liquors in quantities, however small, however disguised, is not only unnecessary, but in the infinite majority of cases, prejudicial to the maintenance of health and strength.

CONVERSATION FIFTY-NINTH.

The uses of Alcoholic Liquors.

Patient.—Since, *mon cher* Doctor, you are so thorough in your condemnation of alcoholic beverages, I should like to know in what cases or circumstances you really would advise their use?

Doctor.—These may be divided into a few categories. In the *first place*, where extraordinary exertions of short duration are imperatively called for. These occasions now and then occur in the life of man, and wherein the object to be secured may be so great as to countervail any sacrifice it may cost. But remember, it is a mortgaging process. Immoderate exertion of mind or body

eked out by stimulants, ends according to the function overworked, sooner or later in a damaged stomach and nerves, apoplexy, palsy, dropsy, epilepsy, madness or fatuity. How many cases of the illustrious dead might I here call up, who were so immolated?

In the *second place*, I would recommend them in cases of temporary exposure to cold and damp, or in passing through a malarious district, where no muscular exercise could be taken, and no food obtainable. Such might occur in travelling. The invigoration of the circulation so produced, and the determination to the skin, might, perhaps, shield the individual from the worse evils of a cough, "cold," and rheumatism. But if such exposure were prolonged, then the depression consequent on the excitement, would render the system doubly liable to be affected by the morbid agencies.

In the *third place*, I would, *with discretion*, recommend alcoholic liquors in cases of *artificial constitution* induced by the artificial habits of society, and where there is complete inertia of all the functions. This state we find in all classes of society, from the highest to the lowest, from the corrosions of the passions or the vices of idleness in the higher, from the wearing anxieties and toil of mind and body among the descending grades of the scale. Alcohol then gives a temporary fillip to the stomach, and enables it both to crave and to digest food; but such a mode of dealing with the case, I admit, is only *putting off the evil day*, and parrying an inevitable blow. The only salvation for such people, is an entire change of life and habits. Here the water-cure is the remedy *par excellence*. Here it achieves its greatest triumphs. For if anything will resuscitate the languid frame, and put life into the dying man, it is "*the whole life of the water-cure*." To this, some fine day, such people—and their name is legion—will come as pilgrims flock to the shrine of Mecca; with this difference, however, that they will not return home humbugged and empty-handed, but on the contrary, enlightened about their corporeal affairs, and masters of much valuable knowledge, better in health, and knowing how to keep themselves so. The body must emancipate itself. But it is the fair boast and glory of us water-doctors, that we best encircle the sick and mortal body, with *all the favouring conditions*, to the putting forth of its *inherent conservative energies*. With our pure mountain air and water, its breezes and scenery, with the perfect repose, regular habits, and early hours; the good fare, active exercise, and agree-

able society; with our baths, local and general, our rubbings, packings, and sweatings, &c., and with *some of us*, a sound and thorough knowledge of our glorious and beneficent Profession; we do for the many forlorn invalids who come here, what no medicinal system, allopathic or homœopathic, *ever did since the creation of the world until now*, and moreover, I do believe, never will do, and never can do, because it is not in the nature of things. To give you the praise and the virtue of the water-cure, concentrated in one short phrase—*it is the re-establishment of the domination of the physiological laws.* Any medical philosopher will tell you, no matter what his *practice may lean to*, that such *must be the best*, and an irresistible agency mighty to cure.

P.—*I fear* many on hearing you break forth in this strain, might say that you were *pro tem.*, imbued with a spirit of exaggeration, or indulging in a little unwonted enthusiasm. For myself, I candidly confess, I believe all you have stated is simple truth, but as I said, I fear you might be misrepresented.

Dr.—Well, and who should be the best judge, who consulted? would you have me proclaim this beneficent discovery, the mighty water-cure, with servile caution and "bated breath,"—or have its manifold virtues whispered with *faint* praises into reluctant and unworthy ears?—would you have *me* do this, who never "crooked the pregnant hinges of the knee, where thrift might follow?"—Must I, in my old age, ask the question, I never asked before,—"What will Mrs. Grundy say?"

P.—Pardon me. The water-cure, I fully trust, will be found all that you represent it to be. I did not mean to check your ardour.

Dr.—The water-cure will meet with all the opposition and difficulties that printing, railroads, steam boats, and *all reformations* or discoveries have met with. Let not this damp our zeal. Beware my good friend of *clinging* to error, beware of slavery to benighting prejudice or vulgar opinion, which has done more mischief than enough in retarding the progress of our race; making nations for ages victims to ruinous tyranny, the grossest superstitions and the most degrading crafts, until they have become as spiritless and unresisting as so many "*industrious fleas.*"

P.—Perhaps you can tell me the curious fact in natural history, how these lively skipping creatures have become so denaturalised?

Dr.—They are kept in a box with *a very low lid.* When they attempt to jump, thump goes the back against it. This tells them pretty plainly, their master's *opinion* of their free and native

flights, and they soon become the *crawling, creeping things* you see, with no jump left in them, no opinion but their master's. But enough, let me resume, by telling you, in the *fourth place*, that alcoholic liquors are, if judiciously used, often a valuable remedy in disease. But here they require to be employed with great skill and caution. Without them many patients would sink who are saved. They are useful to rouse the system from its fatal depression in the *shock* of accidents, in extensive burns and scalds, and in the stage of convalescence from some forms of epidemic fever, especially among the poor and ill-fed—to support the sytem under exhausting discharges and suppurating fonts.

P.—Do you think alcohol of much avail in chronic diseases?

Dr.—Not much. There the *water-cure* is the most effectual restorative. In these cases alcoholic stimulation is rapidly consumptive of the remaining available stock of corporeal power, unthriftily lifting up the wick of "life's poor shallow lamp." All systems of cure in chronic disease, save those that recognise and work upon the inherent power of the system to rectify itself, are fallacies and quackeries.

P.—By this showing, then, the water-cure is no fallacy, no quackery.

Dr.—Most assuredly not, unless all physiological science, and all hygienic art, which are the two strong legs on which it stands, are mockeries and delusions.

P.—Well, to end these long, but not uninteresting nor unedifying alcoholic colloquies, please give me your opinion as to the advisability of alcoholic drinks for pregnant and suckling women, who stand, I suppose, upon a sort of intermediate ground between the healthy and the sick, whom you have been discoursing of.

Dr.—With regard to the first: in a few cases of irritable stomach, small quantities of wine are, unquestionably, often beneficial in enabling the stomach to retain and digest small quantities of food. This is a less evil than to allow mother or fœtus to suffer from starvation. This, of course, will not dispense with due attention to all the other regulations of a sound hygiene: and recollect it is a temporary resource for a temporary exigency.

During lactation, I should most decidedly put my veto on the use of any alcoholic beverage whatever, except in *rare cases*. It affords no elements of the secretion; it impairs both its quantity and quality, and its excess is highly pernicious to child as well as mother. A woman who cannot eat and digest the requisite amount

of food is unfit to suckle; and it would be a cruelty to her and to the infant to exact it. Bad feeding for the child is never justifiable on any grounds, because if the natural is cut off, artificial can be substituted.

P.—But two questions more. Would you give wine to childhood?

Dr—Most assuredly not, hardly under the extremest circumstances.

P.—However undesirable or unjustifiable, then, wine may be for all other periods of life, you will surely grant it for extreme old age, according to the adage, *vinum lac senum.*

Dr.—Believe me, my friend, the adage is wrong. In old age waste is little, the demand for food is little, and the ability to digest it to correspond. We reason from our wants, our wastes, and supplies, to theirs. But it is all a mistake. There is lessened excretion, lessened exhalation, lessened secretion every day. If the food be lessened in accordance with the dictates of nature, the digestive powers will be quite equal to meet the wants of the economy. The failing powers of old age do not indicate the necessity for alcoholic stimulation to superinduce a factitious, unnatural, destructive energy. This paves the way for the introduction of supply above the demand. Hence superfluous labour is imposed on the eliminating organs. Hence the tendency to the *lithic acid diathesis* of advancing life. But understand me, I speak generally; I am not foolhardy or indiscriminate enough to declare, that cases do not occur of positive languor of the digestive functions in old people, wherein a stimulant would do much good. But here general hygienic discipline is of more avail than any local stimulant. I have had patients in this house up to eighty years of age, "*set up*" amazingly without alcoholic drinks. I happen to know that wine *can* be dispensed with in old age, and by those for fifty or sixty years accustomed to it, and therefore to be supposed the most sensitive to its withdrawal. The stomachs of such old people under a judicious modification of the *water-cure*, recover their tone to an extent that no person would credit, not familiar with the results of this mode of treatment.

PART V.

THE PRINCIPLES OF GENERAL PATHOLOGY.

CONVERSATION SIXTIETH.

The need of popular interest and instruction in pathology—"The knowledge of a disease is half its cure"—Medical impostors—Common mistakes daily committed by practitioners in medicine de touts grades—*Pathology, general and special—The humoral pathology—Names of diseases legion—Diseased conditions few.*

DOCTOR.—I HAVE often regretted that there was no popular dissertation on pathology, feeling assured that some knowledge of it would be highly valuable and interesting to a large class of non-professional readers.

PATIENT.—What do you mean by pathology? I know that it is one of the medical sciences, but its definite objects and its exact limits I do not comprehend.

DR.—In the following conversations I shall make a humble attempt to make it plain and intelligible to you, and, perhaps, acceptable to a certain class of our Profession, now passing before my mind's eye. I am not without hope, that some fine day they may honour me with a perusal. The subject is one of the first importance; indeed, in a medical point of view, there is none more so. No doubt, you have often heard repeated, that "*the knowledge of a disease is half its cure*," a truism every day exemplified by those who possess this knowledge, as well as by the failures of the ignorant and superficial *routinier*, who lacks this acquirement.

P.—I can easily imagine how a man must flounder about in the dark, whose ideas are mystified, vague, and unsettled, as to the seat or nature of any disease he may undertake to cure, or ameliorate. It is really to be deplored, that any man with sentiment, or regard for humanity, could be found to engage in so reckless and cruel a proceeding; or that any sufferer should submit to the hazards of his care.

Dr.—There are plenty to be found; men who are ready at a day's notice to practise hydropathy, allopathy, homœopathy, or anything you please; many of them barely knowing where even the liver rests, or if their knowledge goes so far, knowing nothing of the *function* of that or any other organ. What would you say if I proposed that you should take your watch to a *pretended* watchmaker, whose life had been passed in breaking horses, or in breaking stones,—a *hard* and *big* fisted man, with a *heart* and *head* to correspond,—and without an idea how to set about discovering the cause of its stoppage or irregularities? I dare say you would hesitate before submitting your chronometer to his experimental explorations. Yet I remember you once submitted your precious body to the tender mercies of a more flagrant and impudent an impostor than the one we have imagined.

P.—I *do* remember, and I paid dearly for the ignorance of *both*. I now begin to understand your anxiety that a little knowledge of ourselves should be more diffused, for it is evident that it would leave fewer victims for these vampires, and fewer patients for the *uninformed* and *defective practitioner*. I should like to know what are the mistakes most frequently committed by the incompetent?

Dr.—It would exhaust a few conversations, I assure you, to enumerate the most frequent errors of diagnosis. I will mention the first that occurs to me. For example, there are *pains* we call neuralgic, they pay little respect in selecting the localities they attack; all parts of the body are subject to them. This is bad enough in itself, but they are frequently mistaken and treated for rheumatism; the medicines ordinarily given for the latter aggravating the real complaint, and making it more difficult of cure. Again, the *heart* is often treated as diseased, and the patient made to endure much fear and discomfort, when, in reality, the heart is sound enough; its undue action or irregularities being merely a symptom and sympathy,—a ringing of the *alarum*, if you please, to aid in giving notice that irritation or serious morbid action is going on elsewhere. How often, too, do we find the *kidneys* made the scapegoat, and treated as if they were seriously diseased, the *urinary deposits* being taken as evidence against them; when, in fact, so far from being morbid, they are often only acting the part of good kidneys, by eliminating and throwing off from the system, the impurities and poisons accumulated there, by improper living and the long continuance of *medicinal irritants*.

P.—Permit me to interrupt you with one question. I happen to have met with many patients here complaining of real or supposed kidney disorders. How do you succeed with them? tell me briefly.

Dr.—The results are generally very satisfactory; of course, for the first few days, the interesting question that agitates the patient is that of the *urinary deposits*, which have long been a source of much anxiety, interest, and attention. In this stage my sympathy, aid, and microscope are quite at their service; but, truly, in the *majority* of cases, the claims on either do not last long. With the assistance of the *water-cure*, other emunctories and purifiers come to the rescue of the kidneys, the necessity for their extra labour soon ceases, leaving no *urinary deposits* either for microscopic examination or chemical analysis. Again, CHRONIC BRONCHITIS, attended with copious heavy expectoration, wasting, fever, &c., is often mistaken for TUBERCULAR CONSUMPTION, which leads to great mistakes, and considerable inconvenience. (See Letters in the Appendix.) Another occurrence, by no means unfrequent in the nervous and exhausted, is that of severe *spasmodic pains* of a persistent character being mistaken for *pleurisy*, inflammation of the liver, stomach, &c., leading to bleeding, blistering, and no end of calomel, and leaving the patient a martyr to *chronic maladies*, all but incurable, if not quite so. *Stimulants* and *tonics* are often given with the best intentions, and prove anything but what their names would indicate: their effects being that of *irritants*, resulting in depression and a worse condition. I might go on thus through the whole catalogue, but enough, let these suffice to propitiate your attention.

P.—Many thanks. I remember you once told me that, important as you considered the knowledge of pathology, still it is not so long ago since it became worthily appreciated, and cultivated as it should be.

Dr.—It is to some of the greatest benefactors and brightest ornaments of our profession, that we owe the rapid progress of pathology and morbid anatomy. For myself, after passing some years as a student at the Liverpool Infirmary, I owe much to my good fortune in having matriculated at Trinity College twenty-eight years ago, which led to my attending, for *four years*, the clinical or bedside lectures of Drs. Stokes and Greaves, as well as *all* the lectures of Dr. Macartney, the then celebrated Professor. At that time, he delivered as an *extra*, what we called his pet course, on patho-

logy and morbid anatomy. These lectures were attended, *con amore*, by many of his large class, but they were *not* required by the examiners, for *pathology* and *auscultation* in those days were considered "outlandish," and the *stethoscope* and *speculum* "foreign jim-cracks." I fortunately took notes of these admirable lectures during *four* successive winters. Often would the Professor say,—"It is not now that you can *fully* appreciate these lectures; but the time will come when you are advanced in years, and practice, and the major part of your life passed at the bedside, that you will know their value, and congratulate yourselves on having diligently attended them." During a long period subsequently passed in the French hospitals,—where bedside teaching is a *reality* and not a *sham*,—I found the advantage and truth of all that I had heard from this profound physiologist and admirable teacher. Later I visited the principal German hospitals, as far as Vienna. I afterwards looked into the Italian hospitals for several winters, in my slow progress from Milan to Naples, and found pathology and accurate diagnosis in the ascendant, and rapidly progressing.

P.—Macartney's fine museum of preparations was bought by the University of Cambridge, I believe?

Dr.—It was, and you will find it worthy of a long visit. But now to the matter more strictly in hand, and let us begin at the beginning.

Pathology is the science which teaches the nature of disease. It is divided into two branches—*special* and *general*. The former embraces the discussion of all the particulars relating to individual diseases, as usually classified. General Pathology comprises the generalities of morbid action, the science or philosophy of the *causation of disease*, the specific processes by which the structural and functional alterations are brought about, and the symptoms or appreciable signs they give rise to.

P.—In the matter of disease, I suppose you must have a standard of comparison, that is, health? How would you define *health* in contradistinction to *disease*?

Dr.—Health may be defined as the regular performance of the functions of the living organism. Disease is the irregular performance of those functions. This irregularity consists in the faulty conditions of the fluids and solids of the body, and in the excessive, defective, or perverted actions they give rise to.

P.—Disease, according to this showing, then, is not so much an *entity*, as *a mode of corporeal being*?

Dr.—That, however, is scarcely a logical distinction, if it be not a frivolous one. A fatty liver, a tuberculated lung, a granular kidney, an hypertrophied heart, a scirrhous mamma, are certainly very palpable entities, as well as modes of structural being.

P.—But may not these be called the *material characters, seats, and modes of action of diseases?*

Dr.—That is again hair-splitting. Such structural alterations, and the changes of function they induce, *are* diseases, or all we know of them. The human mind cannot grasp the *essence* or intimate nature of anything. It must be content to regulate its conceptions of things by the *gross* or *concrete, not by the abstract.*

P.—With regard then to disease, all that I require to know, all that I must seek to know, all that the lights of science permit to be known, is whatever is comprised in its material characters or conditions, its seats, and *its modes of action?*

Dr.—Yes, truly; if in the latter you comprise the *laws of the development of disease, its exterior sources, or the agents, ab extra, determining it, and the means of relief or cure.* These, it is my object in these conversations, to make level to the comprehension of every intelligent unprofessional reader.

P.—I have heard that there has been much dispute among you gentlemen of the faculty as to the *localisation* of disease,—how far it is at first *local* in its origin and seat.

Dr.—You refer, perhaps, to the direct operation of the causes of disease. Some contend that this is primarily on the nervous system, and secondarily on the circulating fluids; that local determinations, that digestive, assimilative, secretory, and vascular disturbances are primarily referrible to the state of the nervous influence of the part. This assumption, however, is now untenable. The progress of organic chemistry and microscopical anatomy lend no support to those exclusive theories; in fact, satisfactorily re-establish the old "Humoral Pathology" on its rational and proper basis. While fully admitting the reciprocal influence of the nervous, and sanguineous, and nutritive functions; that, for example, a sudden mental shock to a suckling mother will so instantaneously alter the condition of the blood and make the milk so irritating as to throw the child into convulsions, and often in due time to kill it outright. While fully admitting this, it is a duty to expose the fallacy of this exclusive theory. Of course my time does not admit here of going further than the mere surface of the controversy.

It is admitted on all hands in the profession, that external agencies do act directly on the blood. I, too, who have so much studied that subject from suffering in my own person, admit, because I know from painful experience how much the nutritive functions are influenced by the nervous system, that it is in the majority of cases *brain worry that produces stomach fret;* yet I cannot shut my eyes to innumerable facts of physiology and pathology which prove a primary and direct influence of morbific agents on the blood and nutritive functions. Suspended secretions and retained excretions vitiate the general circulating mass of fluids, and in this way impair the integrity of the solids. In proportion as the circulation is languid or arrested in a part, the due chemical decompositions of the blood, and changes of vital structure, the deposition of new matter, and the removal of old, are prevented or impeded. These retained matters act more or less as poisons on the general circulating mass. Extirpate the kidneys in an animal, or let their functions be suspended in man for but a day, and we have the retained urea in the blood acting as a veritable poison, and speedily extinguishing life, by the maladive influence emanating from the sudden change in the constitution of the blood. The virus of small-pox, syphilis, and of glanders, infects the body through direct absorption into the circulation. Poisons injected into the veins thus affect the whole system. So gases of various kinds act upon the blood as it passes through the lungs. So also various alimentary substances as well as poisons primarily affect the blood by absorption from the alimentary canal. The ferment produced in the blood by certain species of fish, in certain constitutions, is shown by the effort of the system to throw *materies morbi* out from the blood in the shape of a rash. I know that a quibbler might put in objections here, but nothing to shake the validity of the position I lay down, that the blood primarily influences the whole economy, the nervous system *not* excluded. What is scrofula? Not *certes* a local disease. The structural changes by which it is known are the mere visible signs, the faulty nutrition and the morbid exudation of diseased blood. But let me not be construed here as undervaluing the power of the organic nervous system, especially as an element or agent of disease. The blood is unquestionably a vital fluid, *per se;* but that vitality is only retained so long as it is in the living vessels; and perhaps the nerves of organic life influence those vessels more intimately than it is the fashion to admit now that the humoral pathology is

again in the ascendant. There is an evident reciprocal influence between the blood and the nerves of its vessels. This explains the action of tea, opium, alcohol, and other stimulants received into the economy by the way of the circulation. The influence of simple mental stimulus, of hope, of success, &c., on the other hand, in inducing energy of the bodily functions, is an unmistakable proof of the controlling power of the nervous system over the vessels. From this starting point, or by this route, the vital actions taking place in the capillaries are intensified and quickened. This controlling nervous energy resident in the vessels may be impaired or nearly destroyed in several ways. 1st. Through simple excess of blood in the system. 2nd. Through simple deficiency of blood. 3rd. Through poisonous matters as excretions not eliminated from the circulation, or absorbed from without. Lastly, through influences that primarily act on the organic nerves, paralysing more or less their energies, as cold.

Lay this down as an indisputable truth of important bearings on the every-day habits of mankind, that *whatever lessens the energy of the organic nerves lessens the intrinsic vitality of the blood. With diminished vitality comes, of necessity, lessened power of resistance to the causes of derangement, disease, and death.*

P.—La voila! une illumination! You make it out clearly, however, to my thinking, that *the causes of disease act primarily on the blood.* From my own plain common sense, independent of all professional reasonings, I should deem this the most probable hypothesis, on account of the *ubiquity* of the blood in the body, and that in its turn every particle of the sanguineous mass must visit almost every part of the body, and that therefore whatever modification it undergoes in any organ, or from whatever quarter, or by whatever route a poisonous element may be imported, we should expect a more or less severe and general derangement of the economy to follow, and, this general derangement persisting, structural and functional diseases to arise.

Dr.—I perceive you exactly apprehend the scope of the question; let me, however, observe that disease shows its evidences more palpably in certain organs than in others, that it has *seats of election for its down-sitting* (if you will allow me that popular mode of phraseology). The reactions thence proceeding spread the mischief to the contiguous tissues or remote organs, or involve the whole organism. This it does in consequence of various laws, and by various routes. We say the disease spreads in the body, from

structure to structure more quickly or more slowly and gradually. 1st, by the simple fact of contiguity; 2nd, by means of wide spread nervous connexions and sympathies; but, 3rd, at all events as much as any, I am disposed to think, by the channel of the circulation.

P.—I am to understand, then, that many local diseases are the mere *signs and symptoms, the outward and visible, or the inward and sensible evidences*, of a general disorder of the system, of the fluids especially?

Dr.—Yes, you may say *many* local diseases. *The great majority of local diseases* will be within the truth. *Disease of the organs, in a great proportion of cases, is secondary to the changes produced in the blood.* Modern pathology, with the aids of micro-chemical analysis, has made nothing clearer than this. However I must leave room for many exceptional cases. The man who daily swallows glasses of alcohol, or saturates the coats of his stomach with drug poisons, chewed tobacco, &c., &c., will undoubtedly produce a primary local disease there, by the irritation of its coats. But for the worst effects on his constitution, that which will soonest break up its integrity, and pave the way to a premature tomb, will be the absorption of those poisons into the general torrent of the circulation, and the vitiation thereby of the vital processes taking place in the extremities of the capillary circulation.

P.—This I call *the philosophy of the social suicide*, so rife among those who would be horror-struck to be charged with the crime. How true it is, I have often thought, how little and insignificant is the harm our *enemies* can do us,—*it is our friends who kill us.* It is they who pass the social glass, keep us up late, excite our sympathies and anxieties, abuse our confidence, &c., &c. But to the subject before us, which begins to acquire increasing interest in your hands—it strikes me, as an inference from your general views, that the general and even popular *nomenclature* of disease is all wrong; that mankind substitute *names* for *things*, that the ten thousand and one names, if fairly analysed, would mean but a few elementary principles of morbid action?

Dr.—You are quite right. The *names* of diseases are legion—diseased conditions few. Hectic fever, hæmoptysis, hydrocephalus, bronchitis, pneumonia, pleurisy, peritonitis, gastro-enterite, tabes mesenterica, psoas abscess, white swelling, scrofu-

lous caries, sinuses, and ulcers, atrophy, ophthalmia, &c., &c., seem, on the mention of them, a great crowd of diseases, selected from far distant orders in a nosological system, implying as many varieties of disease, while, in reality, this formidable assemblage of hard and soft names, represents but the phenomena following in the train of the general diseased condition of the blood.

The grand error of physic, in all past times, and the most fruitful source of suffering and death thereby, has been this setting of *names* for *things*, fighting with shadows (symptoms) instead of realities (diseased conditions themselves). Hence the *matter*, *manner*, *seat*, and *nature* of disease were postponed to its *name*, and alike neglected in the measures of medication; corporeal ailments being treated according to names; and ten thousand remedial expedients being devised to meet every variety and shade of symptom; and thus and thereby to "knock down" diseases, as it was phrased, but more properly and literally knocking down the patient, often to rise no more. To this end were contrived SPECIFICS to *cure* headache, heartache, bellyache, and pains of every sort; convulsions, delirium, stupor, apoplexy, palsy, sleeplessness, deafness, blindness, breathlessness, cough, expectoration, palpitations, faintings, blood-spitting, indigestion, acidity, flatulence, oppression, spasm, debility, constipation, diarrhœa, jaundice, dysuria, anuria, diabetes, dropsy, excessive or defective perspiration, &c.

P.—I presume this enumeration of symptoms, as you make them out, comprises the chief elementary derangements of the human body. According to your doctrine, I should imagine they depend partly on constitutional mischief, partly on local disorder, as in the prime organs—say the lungs, stomach, bowels, brain.

DR.—Your conclusion is perfectly just.

P.—The point is to appreciate, or define exactly, these elementary derangements, general and local, can you do this?

DR.—Not always. To determine these points, is precisely the problem to be solved in the theory of medicine, and is the line of research that is now engaging the ardent spirits engaged in pathological chemistry and microscopy. These ultimate corporeal derangements (technically called *pathological conditions*), and the corporeal phenomena resulting therefrom, are probably, all of the essence or essentials of disease man's frail senses will ever discern. To investigate these morbid phenomena, with their course, symptoms,

and sympathies, and to view them in connexion with the outward causes of deranged action, as elicited by the history of the patient's antecedents, is to have the clue that will best guide us in the intricacies of every case.

CONVERSATION SIXTY-FIRST.

PATHOLOGY, OR THE NATURE OF DISEASE.

Proximate, predisposing, and exciting causes of disease—Predispositions themselves the result of exciting causes—The external active or exciting causes of disease—Natural "modificateurs" of the body—food, drink, heat, light, electricity, &c.

PATIENT.—To-day I should like you to enter on the subject of the specific causes of disease. The philosophy of the general causation of disease, as expounded in your introductory conversations, interested me much; and I think the subject was well and pertinently brought in there, both as pregnant with matters of more than scientific interest, and as abounding, in short, in truths that *come home to every man's business and bosom.* This subject, of course, excluded all questions touching the specific causes of disease. On this subject, more strictly within the province of Pathology Proper as you define it, I should like to hear what you have to inculcate.

DOCTOR.—Of course I can give you here only some very general statements. The details must be reserved for other conversations. Some of these have been already given when discussing the questions of diet: others will be given in our conversations on hygiene, regimen, and particular diseases.

To begin, however. The usual condition of the production of disease is the conjoint operation of various classes of causes. The division of these usually adopted by teachers and system-makers is into *proximate*, *predisposing*, and *exciting*. The first of these we eliminate as a trivial scholastic distinction at best. What is termed the proximate cause of disease, is, in truth, the disease itself, as I have defined it, viz., those functional and organic derangements —those alterations of the solid or fluid constituents, which are the

mainspring, the source of all the morbid phenomena; and therefore which really constitute *the disease* in any given case.

P.—With you, then, the grand division of the causes of disease is simply into the *predisposing* and the *exciting?*

Dr.—Yes, we must take this division. It will answer our purpose. But even *it* is not the most accurate or philosophical. For the predisposing causes are, in most instances, if not in all, themselves actual diseased states, rendering the body liable to be affected, to be more generally and intensely diseased, by external agents otherwise innocuous. The *predispositions* themselves are the result of exciting causes of disease previously in operation, mostly the result of individual mismanagement, sometimes the fault of ancestral taint.

P.—But may not these predisposed states of body be simply *below par* conditions, of the whole or parts, and not actually diseased states?

Dr.—In a few rare cases I admit they may be so—cases of simply and purely feeble vitality. But that scarcely or rarely co-exists with the structural or functional integrity of organism. The vitality is feeble, because its solids and fluids are badly constituted. Here we come to disease as I have defined it. In ninety cases in a hundred, the predisposed man or woman is one *actually diseased.* For example, the persons predisposed to cholera, are those whose digestive canal is in a state of deep and advanced disease (*gastro-enteritis chronic*) from misery, anxiety, undue or excessive alimentation, alcoholic drinks, or drug stimulation, &c.

P.—I quite understand you.

Dr.—But for practical purposes, the division in question will answer: only it is right to show up error wherever it exists. And it would be well for many if they saw the matter of predisposition to disease in its true light, for then would they take precautions to rid themselves of lesser maladies, in order to prevent the chance of falling into greater.

P.—Again, your old principle, "*principiis obsta.*" But what do these predisposing causes more specially include?

Dr.—As they embrace all strictly *organic* susceptibilities or peculiarities, in consequence of which disturbing external agents affect some constitutions more than others, I should take leave to designate, for the sake of philosophical accuracy, the usual *predisposing* causes, as internal passive or *organic causes,* those existing in the state of the living fabric, in contradistinction to the

external active or exciting causes—those existing in the world without.

The whole might be resolved strictly into exciting or external causes, if we possessed bodies in perfect health. But in the maladive condition of society as we find it, let the received division stand, as better understood practically, and, moreover, a thing "familiar in men's mouths as household words."

If the exciting causes are sufficiently strong, they operate without the concurrence of any predisposing causes. Whereas the predisposing cause never operates without the conjunction of an exciting cause.

P.—Further making out your doctrine, then, that the exciting cause is all in all. But in so subtle a domain as that of life and organisation, must it not be extremely difficult to appreciate the relations between cause and effect?

Dr.—Extremely. Everywhere else in nature this law evidently exists, namely, that similar effects always result from similar causes. But in physiology and pathology there *seems* to be often an exception; but one only *seeming*, not real, in the causes of disease being present, without the effect following.

P.—Wherein is the difficulty here—how do you explain it?

Dr.—The field of observation, as you have remarked, is extremely subtle. That conjunction of an internal condition with an external cause necessary to many diseases is wanting; and there is great difficulty in appreciating sources of fallacy that occur amid a crowd of unperceived circumstances, capable of infinitely modifying the health. Two hungry men eat the same food, and the same quantity. One has a grievous indigestion; the other suffers nothing. One is a dyspeptic, or there was not in his system the same *receptivity* as in the other case. The same exposure to cold that will give one man diarrhœa, will produce inflammation of the lungs in another; and in a third case produce only extreme hunger.

P.—To return, then, to predisposing causes, what are they?

Dr.—Under the head of predisposing causes are comprised hereditary taints, diseased tendencies, or actual diseased conditions, and all circumstances relating to age, sex, constitution, temperament, individual habits, sleep, excretions, voluntary motion, the exercise of the intellect, and the sway of the passions.

P.—Well, what of your external, active, or exciting causes of disease?

DR.—These embrace the operation of all the natural "*modificateurs*" of the body. These comprehend every variation in quantity and quality of those outward stimuli of the living organism, appointed by the Creator to replenish its vital properties, to maintain in the normal state its functions, to repair the daily waste and wear of its solids and fluids. These include, 1, food; 2, drink; 3, heat; 4, light; 5, electricity; 6, mechanical injuries; 7, chemical irritants (medicines, &c.); 8, miasms, or endemic and epidemic influences. These I can only name here. Some of these causes of disease we have discussed in expounding the subject of diet; others will be left till we come to talk of hygiene, &c.

CONVERSATION SIXTY-SECOND.

PATHOLOGY, OR THE NATURE OF DISEASE.

Pathology proper—Disease taken to pieces, to show its component parts—Irritability—Tonic power of cold—Sensibility—Morbid or perverted sensibility—Tic—Hypochondriasis—Coma or stupor.

DOCTOR.—TO-DAY we enter upon a subject—disease—somewhat abstruse and complex, but full of interest. But a careful analysis will completely solve this complexity, and ample illustration will remove all abstruseness.

PATIENT.—I suppose you are going to take disease to pieces, and to show its component parts, on the same principle as you would explain the mechanism of a clock or steam-engine?

DR.—Yes; to know accurately the nature of diseases we must proceed precisely in the same way, by the same mode of treatment; we must show it up in its component parts. In our physiological conversations we described the normal or healthy conditions of the elementary tissues or structures of which organs are composed. These embrace membranes, muscles, nerves, fluids, glands, bones, &c. Now specific diseased states, as inflammation, &c., are the complex result or sum total of morbid action affecting more or less of these component parts of organs. The

clearest view, therefore, of the nature of disease will be given by unfolding its ultimate elements or proximate principles, that is, to show the morbid alterations affecting the various tissues named.

P.—In that way, I suppose, you will show how one diseased structure involves the adjoining, how they react one upon another, the unsound upon the sound, or the morbid phenomena they give rise to. I should also like to know how they are to be recognised and distinguished.

Dr.—Gently, gently. *Festina lente.* All these things will come in, in time and place.

If we are to discuss, then, *seriatim*, the elements whose aggregation constitutes disease, we must begin with,—I. *The diseased conditions of muscular fibre*—morbid irritability. *Irritability* or *tonicity* are equivalent terms, indicating the power of contraction, or tendency to contract, inherent in muscular fibre. To this its healthy tension is owing. It is much under the influence of the nervous system, although not intrinsically dependent on it. It may be *excessive*, *defective*, or *perverted.* Spasms and convulsions, and the great strength of a maniacal or delirious patient, are instances of the first. Examples of defective irritability are exhibited in the results of *over-exertion* or disuse of muscles, in the shock or muscular prostration following injuries, excessive fatigue, poisoning, or prolonged cold.

All hollow viscera and tubes possess the property of irritability, that is, a constant tendency to contract by the mere stimulus of their contents; of this stimulus, the bulk alone of the contents is one element, their irritant nature is another. The rapid and vigorous contractions of muscular fibre thus elicited alternate with relaxations. The bladder, bowels, and gravid uterus relieve themselves of their contents by a reflex action, when the distension they produce reaches a certain point of stimulation to the afferent nerves of their respective organs.

P.—This gives us some glimpse, I presume, of the philosophy of stimulation generally. For example, tea, coffee, alcohol, opium, and other drugs, temporarily augment the tonicity of the stomach and of the arteries, in consequence of their sheer stimulant qualities. The result of this augmented tone of stomach and energy of circulation is an agreeable sense of bodily refreshment and mental exhilaration. Hence the universal and natural fondness of mankind for these "tipples" as you call them.

Dr.—You are quite right in your inference. Cold increases

tonicity in a remarkable manner, as well in blood-vessels as in muscles and skin, provided it be not carried to excess, and that the conditions of reaction be ensured. Heat relaxes muscles and renders them more irritable, but toneless, morbid lowness. Weak but quick motions are characteristic of this unhealthy irritability.

P.—I suppose you will make much use of the fact of the *tonic* power of *cold*, when you come to explain the *modus operandi* of the water processes?

Dr.—This tonic power of cold, properly wielded, may be called the right arm of the water-doctor. But to proceed—

II. *Diseased conditions of the nervous tissue—morbid sensibility.*

Sensibility is the inherent endowment or property of nervous structure. It may be increased, diminished, or perverted, either generally or locally. If the morbid sensibility be general, the disorder is traceable to alteration in the grand medullary masses or centres of the nervous system; if local, then only certain nerves or systems of nerves are implicated. The former may be present in the early stages of inflammations and other acute affections of the brain, as shown by intolerance of light, noise, motion, &c. "Highly nervous people" are instances of a congenital or constitutional excess of sensibility. Over-sensibility is always connected with over-irritability or want of tone. The sympathetic and other actions are also generally involved in the disorders of over-sensibility. The cause of this exalted sensibility is an undue supply of blood, too free or too violent circulation in the parts of the cerebral mass, concerned in sensation, or the abdominal nervous centres. Neuralgia or *tic doloureux* is an instance of *local* exaggeration of sensibility.

P.—Now I wish you would give some instances of *defective* general sensibility.

Dr.—Coma or *stupor* is an example. This indicates impeded circulation, or stagnation of blood (according to its degrees) in the sensitive nervous centres, from the pressure of simple fulness of blood, from congestion, from apoplexy, from narcotism, from anæmia, or deficiency of blood, or from blood vitiated by the retention of excrementitious matters, as urea.

P.—I suppose the class of people that are called "slow coaches," the obtuse in feeling, the sluggish in action, those who have ordinarily no intense pain or pleasure, who feel neither joy

nor sorrow acutely, neither cheered nor depressed easily, are instances of congenital insensibility?

Dr.—Truly, these individuals are sometimes the worst sufferers from gout, constipation, apoplexy, &c., because the early symptoms, being little felt, little complained of, are not attended to, and not recognised.

P.—And, therefore, treatment or precautions are not resorted to in time.

Dr.—A natural result.

P.—Well, now to speak of perverted sensibility, what have you to say?

Dr.—Perverted *general* sensibility is not common, save in *insanity* or profound *hypochondriasis.* I have seen and heard of a great many curious cases. Some have imagined themselves made of glass, and dared not move for fear of shivering to pieces, like a brittle fabric. Others feel as big as a mountain, and fancy that no room or carriage could be large enough to hold them, &c., &c. Perverted *local* sensibility is common, for example, prickly tingling heat or trickling cold in various parts of the body, sensations of a globus or ball in the throat, fluttering at the stomach, depraved appetite, illusions of the senses, pains referred to the toes or fingers of an amputated limb.

P.—A gentleman who lost his hand in battle, for years afterwards had pains in the stump, whose apparent seat was in the lost fingers.

Dr.—A not unfrequent instance also of perverted sensibility. Healthy sensation demands the free supply of blood, not only to the origin and trunk of the nerves, but to their *minutest ramifications.*

P.—Obstructed circulation in a part, therefore, impairs or perverts its sensations.

Dr.—Assuredly, as a too free or impetuous circulation exalts it.

P.—Most dyspeptics know what morbid sensibility of the stomach is.

Dr.—*They* can easily conceive, therefore, how all the special senses may be altered by irritation of their special nerves, or by irritation of the spinal or cerebral matter in which these nerves take their origin. Hence, as regards the eye, we have blindness, or specks, or sparks, or clouded vision; as regards the ear, noises of various kinds; and so of the other senses.

P.—Will you explain how it is that parts, as the stomach, heart, and brain, that convey to us no sensation in health, become the seat of so acute sensibilities in disease?

Dr.—We can only explain this by stating the fact that when the structures in question are in a state of morbid irritation, or inflamed, morbid sensations are the general result. The nervous terminations are no doubt pressed upon by the engorged vessels, and therefore their natural functions interfered with. The orifices and outlets of the body, the functions of ingestion and egestion, are guarded as before, then by peculiar sensibilities. In the state of health we are not conscious of the passage of alimentary or excrementitious matters. It is otherwise, however, in disease. We are painfully conscious of all these things. We have palsy of the rectum and bladder, tenesmus of the former or ineffectual straining, neuralgia of the latter, or painful micturition. We have gastralgia and colics, morbid cravings of hunger and thirst; in short, wherever inflammatory or other allied morbid process is taking place, we have disagreeable reminiscences of possessing teeth, throats, stomachs, livers, bowels, kidneys, lungs, hearts, brains, and nerves,—parts not intended to intimate to us any feeling of their existence otherwise than pleasurable consciousness.

CONVERSATION SIXTY-THIRD.

PATHOLOGY, OR THE NATURE OF DISEASE.

Voluntary power—Reflex function as an element of disease—Centric and excentric convulsions—The ominous rale *of the moribund—Mistaken remedies.*

Patient.—Now, most patient of doctors, I hope you are prepared to tell me how these *voluntary* and involuntary, or reflex functions of the nervous system, become, by their excesses, defects, or perversion, elements of disease?

Doctor.—*Voluntary* power is in excess in erythism of the

nervous centres, that is, when the brain is excited by strong emotions or passions, by stimulant liquors, or by the galloping pulses of delirium. Voluntary power is suspended in terror. It is perverted in chorea or St. Vitus's dance, delirium, and hysteria. It is defective, from excess of blood in the brain, in plethoric lethargy or apoplectic coma. Examples of partial excess of voluntary power are rare, as those of its partial defect are common, as palsy of various kinds. This partial defect occurs when there is disease, first, of the anterior or motor columns of the spinal marrow or medulla oblongata; second, of a motor nerve in its course; third, in the ultimate ramifications of a motor nerve. These functional aberrations of the nervous centres, or of the nervous conduits, the seats or the channels of voluntary power, are usually dependent on structural changes of various kinds, as *tumours*, *effusions*, *hæmorrhages*, altered states of the blood-vessels, or of the circulating fluid.

P.—Please to go on with your process of taking to pieces of disease, and of showing me of what elements it consists. The study is sufficiently interesting, and I already perceive how much it will facilitate my comprehension of the more complex results of morbid action. The reflex is so extraordinary a device in the animal economy, that my curiosity is excited to hear it treated of as an *element of disease*.

Dr.—You are aware, from our physiological yarns, that the reflex function includes all the various movements and processes connected with organic life, viz., the contractions of the sphincters, of the œsophagus, of the glottis, of the iris, of the eyelids, of the respiratory muscles, of the heart, of the stomach, of the bladder, and, to a certain extent, of the arteries, &c., &c.

Undue excitement of the nerves presiding over the true spinal excito-motory functions lies at the foundation of the phenomena of hydrophobia, tetanus or lock-jaw, hysteria, hurried respiration, nervous palpitations, convulsive cough, violent vomiting, hiccup, &c. In some of these cases, the irritation is propagated from a distinct nervous branch, as in a wound, to the medullary or nervous centres, there producing erythism. In others of these cases, the mainspring of the mischief is irritation of the stomach and bowels (as in the spasms of colic, diarrhœa, &c.), womb, bladder, kidneys, or teeth. *The irritation is thence reflected to the nervous centres, whence it is returned in the formidable shape of the diseases first named.*

P.—I hope you will not think me trifling, but be so good as to

tell me what are the *fidgets?* a question I have often asked in vain.

Dr.—Another illustration of the excitement of this involuntary or excito-motory system, and generally originating in *malaise* of the gastric centre, or the nervous apparatus behind the pit of the stomach.

P.—*Convulsions*, I think, are your most interesting illustration of irritation affecting the reflex system.

Dr.—Yes. They are referrible to two sources. Dr. M. Hall has designated the 1st. Centric, viz., epileptic and apopletic convulsions from disease of the head, or from loss of blood. In these cases, the spinal marrow and medulla oblongata, being the irritated centres, the excito-motory influence radiates to the limbs and muscles generally. 2nd. Eccentric convulsions, that is, cases wherein irritation at the extremity of an afferent nerve is transferred to the spinal centres, and thence reflected to the circumference.

P.—By referring to this plate of spinal nerves, I understand it perfectly. Now what are *spasms* and *cramps?* As most people, from the prince to the peasant, have had a twinge, one would like to know what they mean.

Dr.—They are instances of the same reflected irritation. As for example, those of the *pyloric* or liver end of the stomach when irritated by undigested crudities or vitiated secretions; the cramps of diarrhœa and cholera; sneezing from irritation of the nostrils; winking from irritation of the conjunctiva; coughing from irritation of the glottis; dyspnœa or difficult breathing from spasm of the bronchi, or intestinal irritation (one species of *asthma.*) In the same manner, by the same channels, inordinate action of the heart is caused by irritant matter in the stomach and intestines.

P.—The heart is highly excited in *fever.* Does the same *rationale* apply there?

Dr.—Quite so. Any considerable irritation anywhere in the system, as inflamed membranes or vessels, or retained excretions, excites the action of the heart and arterial system, producing fever or *constitutional disturbance.* So that fever is always *sympathetic*, not *idiopathic*, or independent. This I shall fully enter into some fine day. It was long the opinion, that these morbid sympathetic movements were brought about by the connexions of the great sympathetic nerve with the several organs. They are now proved to be *phenomena of reflex action*, of which the spinal

marrow is the centre. In general and excessive reflex action, there is always *vascular erythism* or turgescence, or increased flow of blood on the entire spinal marrow and *medulla oblongata*. Simple mechanical irritation of the spinal canal, of the brain, or of the course of the nerves, as from tumours or spicula of bone, will cause convulsions.

P.—What circumstances predispose to, or induce, this exaggerated activity of the involuntary nervous power?

Dr.—It is augmented by sleep, by narcotism, by injuries of the spine, by sedentary habits, &c., in short, by whatever withdraws the body from the exhausting influences of the sensorial and voluntary functions, leaving the stock of power so saved up, to be more freely draughted off for the service of the *organic* or *nutritive* processes. This accumulation of excito-motory power by rest, is the reason why spasmodic attacks, convulsions, fits of asthma, epilepsy, &c., are more liable to occur during sleep, and are favoured by sedentary habits and excessive indulgence in bed.

P.—Thanks. This solves to me the puzzle of my friend, Mrs. ——'s case, why her fits always seized her in the middle of the night. Give me now some instances of *defect* of reflex power.

Dr.—These are numerous and interesting. Asphyxia, fainting, suspended animation, poisoning with opium or strychnine, paralysis of the sphincters, of the eye-lids, of the respiratory muscles, of those of swallowing in hydrophobia, states of extreme debility from excessive fatigue or excitement, or from direct depressing agents, as in typhoid fevers, in apoplectic coma and narcotism, any of these states when they prove fatal, do so by interfering with *the grand organic reflex acts.* The *dead-rattle* of the moribund or expiring person, is an instance of the failure of the reflex functions. The medulla is too exhausted to permit sleep, or even to keep up the respiratory movements, without a painful effort of volition. The breathing becomes irregular and gasping. The excessive weakness disables the dying person from coughing or expectorating, that is, from clearing the air passages of their accumulated secretions. The fitful gusts, impulses, and undulations of the last mouthfuls of air, blow up the phlegm into air bubbles, producing the ominous *rale.* When the medullary or spinal function is much exhausted, sleep is interrupted or prevented entirely by frequent sighing and feeling of oppression, or it is disturbed by startlings, chokings, and fearful dreams.

P.—Although this is not the place to talk of treatment, yet I

should like to know, what expedients have been devised to remedy these derangements of the nervous centres?

Dr.—Much *highly pernicious* ingenuity has been expended, and the mineral and vegetable kingdoms have been ransacked in the search for *stimulants*, sedatives, *nervines*, narcotics, antispasmodics, &c., with too *fatal* success. A host of deadly *poisons*, as *strychnine*, Indian hemp, *woorara*, conium, creosote, zinc, copper, &c., are introduced into daily and extensive use. Nor has ingenuity been spared in devising a variety of external tortures as well—as seatons, moxas, cautery, adhesive plaisters, *tight benumbing* bandages, &c., and with what effect? Here we draw the veil.

CONVERSATION SIXTY-FOURTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Secretion—Cells of the secretory structure or glands—Influence of the nervous system on secretions—What is a crisis?—Defective and depraved secretions.

Doctor.—We shall discuss to day the secretory functions considered as elements of disease. *Secretion*, as you may remember, is a vital endowment of the ultimate cells of the secreting structures or glands. It is hard to say, in what instances this apparatus only *separates*, and in what instances it *forms* the matters it eliminates. The constituents of many of the secretions are found in the blood and in the tissues.

Patient.—You call the glands the great safety-valves of the body. I consider them wonderful in design and action.

Dr.—You may say so truly. By their vital operations the blood is continually drained, and purified of its noxious products, wasted elements, superfluous nutrition, &c. In this way, the excess of *azote*, *carbon*, and *hydrogen* is removed from the system.

P.—Their due individual play, therefore, and their harmonious co-operation, must be necessary to maintain the uniform and healthy proportions of the blood's constituents.

Dr.—Unquestionably. If the activity of one secretory outlet predominates over the others.

P.—The equilibrium is of course lost, and what is the result?

Dr.—Why, in the first place, certain matters are removed in excess, matters perhaps, that *should not* be eliminated. In the second place, an undue amount of other matters that *should* be eliminated, is retained.

P.—In either way to derange the constitution of the blood, to alter its constituents?

Dr.—Yes. In bilious diarrhœa, for example, the urine is loaded, and fever runs high. In a robust subject, this subsides with perspiration or a urinary deposit.

P.—In that case the *modus operandi* is clear, the *kidneys* or the *skin*, with the previous action of the *bowels*, rectify the disorder by restoring the equilibrium, or proper proportions of the blood's constituents.

Dr.—Undoubtedly. This may be called the balancing function of the secretory organs, a power that may be much more turned to account than heretofore in the treatment of disease.

P.—A power that you water-doctors *do* turn greatly to account. For part of your system is the opening of the body's safety valves, and letting out the "bad stuff." Priessnitz was not so far wrong there.

Dr.—Very near the mark, in putting the body *in such condition as to enable it to throw off waste matters*, the most noxious, as the gouty, syphilitic, &c., &c. Organic chemistry too, backs him out pretty fully here.

P.—What circumstances most influence the quantity and quality of the secretions?

Dr.—*First*, the quantity and quality of the blood. *Secondly*, the force or feebleness of its current. *Thirdly*, affections of the animal (senorial) nervous system, that is, mental processes, thought, emotion, desire, passion, joy, sorrow.

P.—The well known facts of the poisoning of a nurse's milk by her emotions, or the *acrid bile* following *vindictive passions*, I suppose you would adduce as an illustration of this last source of the influences modifying the secretions.

Dr.—Facts quite in point. But I was proceeding to observe, in the *fourth* place, that the effects of accidents, collapse, mechanical injuries or shocks, animal poisons, &c., operate to impair or suppress the natural excretions. In these cases, the nervous centres,

the seats of reflex action, are paralysed. In extreme degrees, how noxious this suppression is, what grave diseases it induces, *you* can now quite appreciate.

P.—The slighter degrees even of defective secretion, I should presume to be also fruitful in elements of disease.

Dr.—It lies at the foundation of a great many maladies, *e. g.* gout, rheumatism, all cachectic states (bad habit of body), disorders of depraved nutrition, dropsies, morbid products or structural degenerations, as tubercle, cancer, &c.

P.—So that after all, there is a great body of truth in the old doctrines of the *humoral pathology*.

Dr.—The whole tendency of modern chemical science, aided by the microscope, is to place the humoral pathology on its true basis.

P.—That is much to confess from an old pupil of Brossais.

Dr.—There you are exaggerant. The immortal Brossais was not blind to the state of the fluids, though called a solidist. How could the *first practical* physiologist and pathologist then living be so? If his invaluable life had been spared, I believe he would have been now *the great water-doctor*, as he was, when living, *the greatest physician*.

P.—Andral and Louis are better known in this country?

Dr.—If there had been no Brossais, we should have heard little of Andral and Louis; he preceded them. Dr. Marshall Hall calls Louis the most laborious and accurate physician of modern times. I remember hearing Louis call Brossais the "*Grand*," in reply to a pert young doctor who was speaking lightly of him; yet Brossais had dealt rather harshly with Louis in some of his writings.

P.—Brossais was the greatest medical reformer of France, I believe?

Dr.—He was, or of any other country. His many invaluable works, and laborious medical life, will send down his name with honour to the latest posterity. I have often been surprised that his "*Examination of Medical Doctrines*" has not been translated into English—a great work that every medical man should read. It was his analysis of the works of our *great John Hunter*, which I read in the work above mentioned, more than twenty years ago, that enabled me to understand *one* to whom our profession owes so much.

P.—I am much interested in this *humoral pathology*. Will you let me hear more about it?

DR.—It throws so much true and available light on the nature of treatment of disease, so vindicates the water-cure procedures, and besides, the details themselves are so replete with interest, that I am sure you will be equally instructed and interested.

P.—Well. To proceed with the *effects* of deranged secretions.

DR.—These may be considered in two chief points of view, 1st. *Intrinsically*, that is, on the organs and blood, whence the elaboration proceeds. 2nd. *Extrinsically*, that is, on the parts whereon the secretion is poured. Of these, I have only time to give a few illustrations here. The *intrinsic* effects of an excessive secretion are debilitating, both from their *strain* of the secreting structure, from their *drain* of the sanguineous constituents, and this injury is according to the nature of the matters excreted. For example, an *excessive* secretion of bile or urine is more weakening than that of nasal mucous or saliva. Torpor always succeeds to over-activity of function.

P.—Well. What are the *extrinsic* effects, say of an excessive secretion of bile?

DR.—They are *irritant* to the stomach and bowels, that is, they exalt its sensibility and irritability, causing a rapid motion of the matters through the alimentary tube, provoking profuse mucous secretions, bilious diarrhœa and cholera; or vomiting, straining, and cramps, from the exalted excito-motory functions. Excessive secretion of mucous *in the bowels* may cause simple diarrhœa, in *the air-tubes*, dyspnœa, asthma, suffocative cough; *in the stomach*, pyrosis or water-brash nausea, vomiting, eructations, &c.

P.—Are not dropsies instances of the *extrinsic effects* of excessive secretion?

DR.—Unquestionably, in internal, shut, or serous sacs, in serous cavities which have no openings, from serous surfaces, or among areolar or cellular tissue. These constitute the various kinds of dropsies, as of the ventricles of the brain, of the cavities of the chest and abdomen, that of the skin, joints, &c. But they also exemplify the *intrinsic* effects, for they end by impoverishing the blood by the robbing of its fluid, and the derangement of its solid constituents, and so breaking up the constitution.

P.—In many disorders, is not excessive secretion a CRISIS?

DR.—Even so.

P.—I should like to hear a *crisis* briefly defined.

DR.—Well, you may call it a *constitutional means of relief*, a termination of a morbid concoction, or a *drain of* NATURE'S *opened*

from the body to let out a materies morbi,—a revulsion *from the interior.*

P.—I thank you; I clearly understand. Well, now what have you to say of defective secretion?

Dr.—It is the usual result of excessive secretion, or of depressing influences.

P.—It is the sign, therefore, of *subsidence of excitement*, of exhaustion of the part excited. Is it not so?

Dr.—In many cases you are right, not in all. Defective secretion of a natural or habitual discharge, will cause general plethora, or local congestion, according to the extent of the damming up of the drain. This general plethora, or local vascular turgescence, will in its turn cause dropsical effusions (which, as we have seen, are real secretions—secretions of vapour condensing into fluids), fluxes or mucous drains, hæmorrhages, inflammations, &c.

P.—Please to give me some instances of the *extrinsic* effects of defective secretion, say of the mucous membranes, of the air-tubes, bowels, or bladder?

Dr.—In the first case, the lungs would be exposed to irritation by every atmospheric change; in the second and third cases, the acrid nature of their contents would inflame the membrane, produce diarrhœa, painful micturition, &c. Insufficient secretion of synovial fluid or joint oil, and (oft an effect) is the cause of pain, stiffness, and inflammation of a joint. A defective secretion of wax in the ear, is a cause of deafness. Defect of bile is a source of indigestion, colic, and constipation.

P.—What effects result from the retention in the system (the *intrinsic* effects) of the peculiar constituents of the urinary and biliary secretions?

Dr.—They act as positive poisons. *Sudden* and *complete* suppression of urine or bile causes typhoid symptoms, extreme depression and coma, ending in death. Urea and the colouring matters of the bile are deposited in various organs.

P.—Well. In partial suppression of the same, I presume the poisoning process is less complete.

Dr.—But quite as decided. There are various functional derangements, producing delirium, lethargy, dyspnœa, palpitations, vomiting, diarrhœa, dropsical effusions, structural degenerations, always fatal if the defective secretion is not restored. If the diminution of the secretion is gradual, the disturbance is very gradual, the system manifesting a wonderful power of accommodation.

These excrementitious matters are detected in the blood, and other solids and fluids of the body. In granular kidney, urea is found in the blood, in jaundice, bile. These matters are also detected in dropsical fluids from diseased liver, kidneys, and heart.

P.—Are the phenomena of fevers referrible to the noxious effects of retained excrementitious matters?

Dr.—To some extent they are. The perverted functions characterising fevers, the states of constitutional irritation and depression they present, the fluidity of the blood and the petechiæ, or fever spots of the skin, show a defective elimination of morbid or wasted elements.

P.—These, I suppose, are the cases for a *crisis* to save?

Dr.—They are so. A copious discharge of these matters by the bowels, kidneys, or skin, often dissipates the morbid phenomena. But they occur in *robust* patients.

P.—I have heard you mention *perverted secretions.* Will you give some instances?

Dr.—These are numerous. For example, calculi and biliary concretions; the urine as altered by irritation of the digestive organs or kidneys; the depraved secretions of the intestinal canal in febrile and cachectic diseases; the acid perspiration of rheumatism; the fetid perspirations of insanity and delirium tremens; the irritant secretions of the mucous membranes; coryza, or acrid discharge from the nostrils; diarrhœa; blenorrhœa; leucorrhœa.

CONVERSATION SIXTY-FIFTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Morbid alterations of the blood as elements of disease—Red globules—Endosmosis and exosmosis—Fibrine, its fibres, cells, and granules.

Patient.—I am anxious to explore further with you the mysteries of the humoral pathology, and to-day would be obliged to you to discuss the morbid alterations of the individual constituents of the blood.

Doctor.—You mean, considered as elements of disease? The *blood*, being an organised compound, constitutes the connecting link between the ultimate and proximate elements of disease. It is the supporter, as you know, of all vital properties. Variations in these properties, or in their manifestations, are referrible to differences in the supply or qualities of this fluid, are both consequences and causes of morbid alterations. Structural diseases being changes of nutrition have their source in altered composition of the blood. The study of these changes, therefore, must be clearly preliminary to that of the alterations of *circulation*, its quickened, retarded, or obstructed course, which ultimately mix themselves up with every morbid process.

P.—Give me, then, some account of these elementary constituents of the blood?

Dr.—For this I must refer you again to our conversations on Physiology. To resume again; they are, 1st, red particles; 2nd, fibrine and colourless globules; 3rd, albumen and certain animal matters it holds in solution; 4th, oil; 5th, salts; 6th, water. All, or any of these, may be excessive or defective in quantity, or altered in quality. The standard relative proportions of these constituents in 1,000 parts are, according to Lecanu, Andral, and Gavaret—

Red globules . . .	127·
Fibrine	3·
Animal matters in serum .	72·
Salts	8·
Water	790·

The *red particles* are the grand conductors into the system of the atmospheric *oxygen* and *electricity*. They may be held as the great originators of life, for they are *living cells*. They are the chief maintainers of the great vital processes. They are the prime elements on which depend the beauty and vigor of men and animals. Their proportion varies with the state of health. In healthy men it averages between 120 and 140 in 1,000. In women from ten to twenty less. Their increase is connected with an active state of the nutritive functions. *Iron* is one of their constituents. In consequence of this, they are fitted to be conductors of the vivifying principles of the atmosphere. They abound in the sanguineous temperament, and in strong constitutions.

P.—I suppose the florid colour of the lips, cheeks, and gums of

such persons, indicates this abundance of red particles in their blood?

Dr.—It does. It is also indicated by the deep blue hue of the superficial veins, and by the brilliant carmine crimson of their blood, shown on a white surface. Excess of red particles is associated with general functional or organic excitement. In robust people, who live well, with sufficient exercise in the open air to maintain the activity of the digestive and assimilative organs, their animal heat, irritability, and sensibility, are in an exalted state, verging on febrile excitement. In sanguineous plethora, and in hæmorrhagic diseases, before much blood is lost, their proportion reaches, sometimes, as high as 185 in 1,000.

P.—In what cases are the red particles deficient? I should infer they are so in pale, puffy people; I mean those of lymphatic temperament.

Dr.—In such the red particles are very deficient; as also in those who inhabit dark and ill-ventilated abodes; in chlorotic and anæmic states; after hæmorrhage; in advanced stages of cancer; scrofula; tubercle, scurvy; jaundice and yellow fever, &c.; in all depraved habits of body; in diseases of the uterus; in malarious diseases; in lead poisoning; after fevers and inflammations; in organic diseases of the liver and spleen, associated with dropsy. In extreme cases of chlorosis the red particles are reduced so low as 27 in 1,000 (Andral). In all these cases the colouring matter of the blood exhibits great variations of hue, from purple to brown, and even to a greenish hue.

P.—What are the signs of deficient red globules?

Dr.—Those which would naturally suggest themselves, as pallor of the skin; soft, flabby tissues; others are a pink colour of the superficial veins; weak functions generally; feeble circulation; calorification; digestion; nutrition.

P.—Excuse so many questions and interruptions; but I am anxious to know what is the state of the red particles in fevers; say, typhus.

Dr.—Here there is an unnatural solution of the red particles, as exhibited in the congestive or ecchymosed patches of deep claret colour (petechiæ). The "coffee-grounds vomit" of cancers of the stomach (and similar matters ejected from the bowels in cases of malignant disease, in melanosis, &c.) are the altered colouring matter of exuded blood.

P.—In our former physiological conversations, you talked of

endosmosis and exosmosis as affecting the blood globules. What are the alterations in this respect produced by disease?

Dr.—They undergo various alterations in form and size. Out of the body, you will recollect, pure water causes them to swell and burst. Saline solutions make them shrink. In the former case they absorb the water from the rarer medium they float in (endosmosis); in the latter case they yield that which they contain to the thicker medium (exosmosis).

P.—Is it probable that similar changes take place *in the body*, from circumstances that alter the proportion of the saline matters and water in the blood?

Dr.—It is an ascertained fact.

P.—You turn this fact to account, then, I suppose, in the explanation of many of the phenomena of disease?

Dr.—Unquestionably and reasonably. In granular disease of the kidney, for example, there is a great drain of albumen from the blood. This is necessarily replaced by water. The red particles thus compelled to float in an unduly rare medium, they *must needs* break up and dissolve in the serum.

P.—May not the faintness and weakness from *long* fasting be, in some measure, explained by the dissolution of the red particles of the blood in the watery serum left after its richer and thicker parts have been drawn off for the purposes of nutrition?

Dr.—The supposition is probable, and not without foundation.

CONVERSATION SIXTY-SIXTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Fibrillation—Albumen, a granular mass not fibrillated—The buffy coat—White corpuscles—Bruit de diable—On what the healthy qualities of blood most depend.

Patient.—I apprehend that below-par conditions of the fibrine of the blood, lie at the foundation of a great many diseases?

Doctor.—Alterations of the fibrine and white corpuscles of the blood, constitute a great element of disease.

Fibrine, as you are aware, is a highly animalised material; it is the basis of the formative, organising, or reparative process. It furnishes the *plasma*, or new meterials, whereby old structures are nourished and new ones generated.

P.—It is, therefore, replete with vital properties?

Dr.—Yes; its fibres, cells, and granules, are regarded as the rudiments of the new living structure. According to Malder, fibrine is the deutoxyde of proteine. Its mechanical construction and constitution are peculiar. *Fibrillation*, or the tendency to arrange itself into fibres, is the characteristic of fibrine. Albumen, as contradistinguished from it, solidifies in an incoherent *granular* mass, *not fibrillated.* The tendency to contract and separate from the red particles are properties of fibrine. The red particles subside; the fibrine rises to the surface.

P.—That is what is commonly known as the *buffy coat of blood*, I presume?

Dr.—Yes; the *buffy coat*, when washed, is pure fibrine. This buffy coat consists of a congeries of extremely fine fibres, with transparent granular bodies (pale corpuscles) separate, and in round encysted clusters scattered through them. These are shown in the wood-cut. Fibrillation never occurs in fluid blood.

P.—I suppose the proportions and quality of the fibrine, like those of the red particles, vary in different states of the system?

Dr.—They do. Even within the limits of health it ranges from $1\frac{1}{2}$ to $4\frac{1}{2}$ in 1,000. An excess of fibrine is characteristic of all inflammatory diseases in strong and young subjects (sthenic). In the later months of pregnancy and in acute rheumatism it reaches sometimes as high as 12 per 1,000. In tuberculous diseases it is also in excess, with a deficiency of red globules. But the fibrine, in these cases, I have no doubt, is more akin to albumen in qualities. I should say that a deficiency in the fibrillating power of the fibrine, a low plasticity of the organisable fluids, with a scantiness of red globules, are the essential elements of tuberculosis. With this state of the blood, how necessary must be a diet rich in fibrine and red globules, as brown meats, &c., that is, when the reduction of inflammatorry irritation permits the use of such a diet; and how improper must be in the same circumstances a diet rich in white corpuscles, and in simply albuminous principles, as a sloppy vegetarian diet.

P.—When the buffy coat is found in blood, does it indicate an absolute increase of fibrine?

Dr.—Not always. It is found in chlorosis, atrophy, and cachexia, states of highly impoverished blood.

P.—What is the state of blood deficient in fibrine?

Dr.—It is marked by fluidity and imperfect coagulation of the blood drawn. In such cases the plastic process fails from the want of its materials. The nutrition of the fibrinous tissues (as muscle) is ill maintained.

P.—What is the test of the proportions and properties of the fibrine? I think I have heard you say, the qualities of the coagulum?

Dr.—You are right. A large firm coagulum indicates abundance of fibrine and red particles—healthy blood. A soft coagulum, on the other hand, shows a deficiency of fibrine, as in scurvy, exhaustion from fatigue, typhoid fever, &c.

P.—In the *post-mortem* examination of a workman, who was killed by an accident, in a cavity of the heart they found what they called a *fibrinous concretion.*

Dr.—That is very common, if not universal. It is not an indication of disease. It is simply the result of the whipping, "or churning" (to use a culinary term), of the blood in the irregular motions of the heart during dissolution.

P.—Does excessive muscular exertion and fatigue, by the great waste of muscular substance it produces, tend to exhaust the fibrine?

Dr.—Yes. It expends much—so much, that the blood is fluid in animals hunted to death. It is also fluid in cases of poisoning, in typhoid fevers, and wherever the change from venous to arterial blood is impeded. Deficiency of fibrine is characteristic of the hæmorrhagic diathesis, or dispositions.

P.—What constitutional effects result from a deficiency of fibrine in the blood?

Dr.—A tendency to congestion in the lungs, brain, and other organs.

P.—How do you explain that?

Dr.—Most satisfactorily. A certain consistency of blood is favourable to its passage, especially through the capillary vessels. Very thin fluids, it is found, pass with greater difficulty through capillary tubes, than those of greater spissitude. Hence, then,

impoverished watery blood gives rise to irregularities of circulation, and disposes to congestions.

P.—What is that vibratory murmur, which stethoscopists talk of hearing in the great vessels of chlorotic girls, and which the French call the *bruit de diable?*

Dr.—Oh! the "devil" is a toy that makes a whizzing sound. This is heard in the great venous trunks, in all cases where the blood is deficient, or the fibrine or albumen aplastic, and this even in cases where the complexion does not show a deficiency of red particles.

P.—What do you make of the pale corpuscles of the blood —whence are they formed?

Dr.—For what *Dr. Gulliver* makes of them, who is a good authority, I refer you to our physiological conversations. The materials of the pale corpuscles, or the molecular base of the chyle, was a congeries of minute fat globules, coated with thin films of fibrine. Oxygen (and electricity) vitalise these.

P.—Now, on what would *you* say that the healthy qualities of blood most depend?

Dr.—On *three* things—1st, sound digestive organs; 2nd, sound nutrient materials, that is, on the chemical qualities of the oil and proteine furnished in the first instance by the chyle; 3rd, on the activity of the processes of respiration, circulation, and depuration (excretion).

CONVERSATION SIXTY-SEVENTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Fibrine and albumen—Granular kidney—Blood corpuscules—Endosmose and exosmose—Four-fifths of healthy blood is water.

Patient.—Judging from the previous chats you have honoured me with, I do not think you have exhausted this fertile subject of the blood constituents yet. What you last said chiefly related to

its quantity. I now want to learn something of the *alterations in quality* it is subject to.

Doctor.—The whole question of the blood opens to us a wide field of pathological inquiry. I can only skim along the creamy surface, *summa fastigia rerum*, but that I presume will be enough for you, and will be interesting and satisfactory enough.

Fibrine, in point of quality, is to be considered in three degrees. It is either—1st, *euplastic*, standard fibrine, highly organised and endowed with life; or, 2nd, *cacoplastic*, feebly endowed with vitality, of a low organising power, as exemplified in *grey* tubercle, and the indurations of low chronic inflammation; or, 3rd, *aplastic*, totally unorganisable, as pus, yellow tubercle, &c.

P.—Where the fibrine is bad in quality, is it also defective in quantity in the blood?

Dr.—No. There is no lack of it, and it is freely effused in inflammations. It is solely deficient in quality, in elaboration. It is more akin to coagulated albumen than to animalised proteine. In this imperfect plasma the microscope reveals a predominance of granular matter, and fat globules, and scanty fibrillation. The red particles too are always defective. The most healthy plasma, if unfavourably placed for organisation, becomes disintegrated, opaque and aplastic, and ultimately degenerates into fatty and calcarious matters.

P.—Tell me now about the *albumen* and the other animal principles dissolved in the serum. Have you much of importance to say of them?

Dr.—Their numerical ratio is about 76 to 80 per 1,000. *Albumen* is hardly distinguished from *fibrine* in a chemical point of view; but physiologically and pathologically there is an essential difference between them. Albumen has no fibrillating power. It solidifies, as I before mentioned, in an incohesive granular mass. Albumen by giving the blood a consistence favourable for its circulation prevents it exuding through the walls of the vessels.

P.—And, I should suppose, thereby diminishes the tendency to inflammation?

Dr.—Just so. It suspends and preserves the red particles, and sheaths the acrimony of the saline constituents.

P.—How are the proportions of the albumen affected by disease?

Dr.—Less than any other principles of the blood.

P.—Do not poor living, hæmorrhages, evacuations, or wasting

drains and discharges of any sort, reduce the albumen and other animal principles of the blood.

Dr.—Yes. But good living and the husbanding of the fluids have less power to raise them above the natural standard.

P.—Wherein have you deficient albumen?

Dr.—In Bright's disease, or granular kidney. It is called albumenuria, for it drains the blood of its albumen. The urine is so charged with it as to be coagulable. The red particles are also deficient, especially in the later stages of the malady. In the dropsical and hæmorrhagic diathesis, deficiency of albumen is a chief constituent.

P.—Well. What did I hear you say about the oil of the blood?

Dr.—A congeries of minute fat globules constitutes the molecular base of the chyle, according to Gulliver. These are coated with thin films of fibrine or coagulated albumen (the deutoxyde of proteine), constituting thus the pale corpuscles of the blood. The fat globules are often so abundant as to make the serum milky. The turbid serum may also be owing to the presence of unassimilated chyle. The serum is milky in blood drawn four or five hours after a full meal. Milky serum is often deficient in albumen.

P.—Is not fat in animals always a sign of imperfect assimilation, or imperfect respiration.

Dr.—Exercise reduces fat by increasing its combustion in respiration; at the same time it augments the nutrition of the muscular tissues.

P.—Obesity, I should suppose to be much determined by the composition of the blood, that is, by the kind of food?

Dr.—You might call it the compound result of lowered respiratory function, sedentary habits, and rich carbonaceous (oily) articles of food, malt liquors, &c., all which tend to make the assimilation imperfect. Fat, therefore, is an error of assimilation, preventing the formation of fibrine and other proteine principles, which are the sources of corporeal strength. It may be easily conceived how this fattening process carried to excess, so lowers the vitality and cohesion of the tissues as to favour degenerations of structure incompatible with health. The atheromatous patches in the coats of the arteries often found in declining age are fatty degenerations.

P.—The saline matters, I believe, are an important element of

the blood. At least I have heard much more about them since the introduction of cholera?

Dr.—Yes. It drains off watery fluids by the intestines in that disease, robs the blood of its serum, and with it the saline matters it holds in solution. Hence, the impossibility of circulating the thick fibrine and albumen, the arrest of its oxygenation, its stagnation in the heart and great vessels, the dissolution or alteration of the red particles. Hence, the livor, coldness, cramps, collapse, and asphyxia, characteristic of the disease. The salts of the blood tend to preserve the form of its red particles, and the fluidity of its fibrine. An excess of saline matters in the blood (as from salt food) must empty the blood corpuscles by endosmose. They are accordingly found puckered at their margin in such cases. In purpura hæmorrhagica, a disease which presents an excess of saline matters in the blood, these phenomena are presented. The effect of this shrinking of the red corpuscles, in the capillaries at least, must be to drain the adjacent textures and surfaces of all their superfluous or available fluids.

P.—I suppose this is the cause of the feeling of thirst, the necessity of replacing the moisture of the parts so drained, and the refilling the shrunk blood corpuscles which had yielded their supply in the general lack.

Dr.—But independent of this source of waste of fluids, the exhalations from the skin and lungs drain the body of its watery fluids, according to the activity of those exhalations.

P.—When the supply, therefore, of the watery portions of the blood is not timely renewed, the blood corpuscles must yield their fluids and shrink by exosmosis?

Dr.—A clear conclusion, borne out by fact.

P.—Hunger, I suppose, is an equivalent feeling, the voice of the organic functions uttering their demand for nutrient solids.

Dr.—True in fact and sentiment. The waste created by the simple play of the vital machinery, and the more exhausting efforts of voluntary motion, *use up* the constituents of the blood. These must be replaced by the food.

P.—I was surprised to find the watery contents of the blood so large an ingredient in its composition.

Dr.—*Four-fifths* of healthy blood is *water*. This proportion increases as that of the animal contents decreases, as in hæmorrhages, anæmia, chlorosis. An excessively watery state of the blood is marked by great facility of effusion, either of its serum or

its red particles, producing dropsies, hæmorrhages, or mucous fluxes. The effects of a large quantity of fluids, *suddenly ingested*, are oppression, palpitation, and dyspnœa, until the urine or perspiration relieves the distended vessels.

P.—I suppose there must be a deficiency of water in the blood in diarrhœa, diabetes, and in excessive perspirations.

Dr.—This is a very obvious result from the drain produced by these diseases. The depletion of the vessels they produced is evidenced in the diminished bulk, generally, of the circulating current, in the smallness of the pulse and the shrunk appearance of the surface. The characteristic thirst is nature's prompting to the remedy of this state of matters.

P.—A high temperature and prolonged labour must expend the water of the blood?

Dr.—Unquestionably.

P.—What are the effects of drinking freely of water?

Dr.—This we shall discuss at length when we come to the *water processes*. Suffice it here to state, that drinking freely of water excites the whole vascular system and the secretions generally, washing out used up, superfluous, or noxious matters. It prevents the formation of *lithic acid* (Prout), or facilitates its conversion into urea.

CONVERSATION SIXTY-EIGHTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

The respiratory function and other excretions, their influence on the blood—Sedative and equalising effects on the circulation of the shallow bath, long continued, with general friction—Results of defective or retained bile and urine.

Doctor.—To-day we shall discuss the changes effected in the food by respiration and other excretions, viewed as elements of disease.

Patient.—I can easily conceive why variations in the respiratory function should greatly influence the state of the blood.

Dr.—Diseases of respiration are characterised by defective changes in the blood. The evils thus induced are aggravated or mitigated according as the derangement is sudden or gradual in its supervention. For example, in emphysema of the lungs (distended and ruptured air-cells), there is such a degree of imperfect respiration (indicated by the livor of the lips and cheeks) that would at once asphyxiate, if of sudden origin. So also in *cyanosis* (*blue disease* from congenital malformation of the heart), respiratory defects are long borne, that would be promptly fatal under ordinary circumstances. The respiratory functions of hybernating and new-born animals are reduced to the lowest degree.

P.—What are the general consequences when the respiratory changes are defective?

Dr.—The fibrine of the blood is scanty, and the muscles, consequently, weak. The animal heat is very reduced, and there is a great tendency to hæmorrhages. Slight exertion brings on palpitation, faintness, insensibility. Cold is intensely felt. The powers of body and mind are alike prostrated. Amatory passion is totally extinguished.

P.—It is well known that the rapidity of the circulation is always in proportion to the activity of the respiration. Will you explain *how* this is?

Dr.—Active muscular exertion augments the play of *all* the functions, and produces, therefore, increased waste of all the structures of the body. This demands their quicker elimination. This, in turn, necessitates quicker aëration of the blood; this quicker respiratory movements; this quicker circulation.

P.—The problem seems easily solved. The steps of a *demonstration* could not be clearer. What are the phenomena of arrested respiration, or asphyxia?

Dr.—1st. The blood partly stagnates in the lungs and right compartments of the heart, and in the great veins leading into it. 2nd. Some passes in the venous state into the arterial system. 3rd. A deficiency of oxygen in the blood, and an excess of carbonic acid and other retained excretions. 4th. Failure of the vital functions from the absence of a positive vital stimulus, and the presence of a positive vital sedative or poison.

The symptoms produced by this state of matters are of two classes. 1st. Those attributable to failure of function, namely, muscular debility, feeble action of the heart, pallor and coldness of the surface and extremities, abolition of the senses and mental

faculties. 2nd. Those arising from the poison and stagnation of the black blood, namely, palpitations of the heart, flashes in the eyes, noise in the ears, muscular spasms. The failure of the heart's action by syncope will retard the operation of asphyxiating causes. Hence the possibility of restoring many apparently dead.

P.—Your hydropathic mode of resuscitating such persons, I believe, is by long rubbing in the *shallow* bath, by active assistants?

Dr.—The bath is used at different temperatures, at first, chilled. This is not only the most feasible and physiologic restorative, but at the same time most effectual. It is the only common sense expedient for dissipating the congestions of asphyxia, and equalising the circulation. In cases of apoplexy, the results, in the eyes of the novice, are marvellous.

P.—The other excretory outlets, when deranged, must be important elements of disease. Will you now explain to me the results of defective urine?

Dr.—In sudden and intense cases, it produces typhoid symptoms, suffocative catarrh, vomiting, diarrhœa, inflammatory effusions into the serous cavities. In slower and milder cases it produces cachexia and dropsy. In the former instances the retained excrementitious matters act on the nervous system as a narcotic poison. In the latter cases they operate merely as an irritant; kindling low inflammation in various membranes and viscera. In still lower degrees, they simply produce functional disorder, fluxes, dropsies, impoverished blood, and diseased structures. The deterioration of the fibrine, albumen, and red particles of the blood in these cases, easily explains the break-up process of the economy.

P.—What are the results of *defective* or retained bile?

Dr.—In jaundice the colouring matter and other ingredients of the bile are retained in the serum and fibrine, and deposited in various tissues. Tingling, itching, and eruptions of the skin, is a common result. Retained bile, unlike retained urea, is long in producing local irritation, or inflammation, or general dropsies. Eventually, however, jaundice terminates in general cachexia, impoverished blood, and dropsy of the belly, chest, and cellular tissue. In jaundice of sudden onset the work of dissolution is very speedy, the retained bile probably suddenly dissolves the red particles, at all events, it operates as a rapid poison.

P.—What are the effects of an *excessive* secretion of bile?

Dr.—If of sudden occurrence, it produces a regular "bilious

attack," giddiness, faintness, drowsiness, without much forewarning. If of slow accumulation, then simple "biliousness," which usually winds up, or explodes off, also in a more regular attack, perhaps vomiting and purging, or simply a bilious diarrhœa.

CONVERSATION SIXTY-NINTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

The skin, and matters in the perspiration—Lactic acid and the lactates of soda and ammonia—Faulty digestion and assimilation with lactic acid and ammonia—Urea and gravel—Diabetes—Inoculation, and poisonous matters.

PATIENT.—In what way do deviations of the perspiratory function become elements of disease?

DOCTOR.—Perspiration contains lactic acid, and lactates of soda and ammonia, the products of the decay of the muscular tissues, in which this acid abounds. During muscular exertion these products are largely evolved. Hence, if perspiration be checked at these times by external cold, we run the risk of the following evils: 1st. The retention of these excrementitious matters in the blood, causing rheumatic, urinary, or cutaneous disease. 2nd. The sudden check or diminution of the vital changes or active operations going on in the skin. The surface is thus permanently chilled, especially if the body is fatigued at the time. 3rd. The equilibrium of the circulation is disturbed, internal congestions are favoured. 4th. An increased amount of work is thrown on the other excreting organs, as the lungs, liver, or kidneys; this being an effort of nature to substitute the duty of the obstructed functions.

P.—If this compensating agency should fail, or prove inadequate to the elimination of the lactic acid, what then?

DR.—It then, of course, remaining in the system, becomes a source of disturbance and disease.

P.—How tells this state of matters on the constitution? I mean, what particular diseases do these retained matters, and the consequent disturbed balance of functions, dispose to or produce?

Dr.—In irritable, or inflammatory subjects, we have rheumatic fever, as the result. In ill-conditioned and torpid systems, we have erysipelas, local rheumatic or gouty pains; occasionally pemphigus (a raising of the cuticle into blobs or blisters). In these cases, the secretions of the skin and kidneys are acid, and the blood even is acid, or deficient in its usual alkaline reaction. In low forms of rheumatism and neuralgia, Dr. Prout conjectures, the *materies morbi* to be OXALIC ACID.

P.—What is this uric or lithic acid (for I believe they are the same thing), about which we hear so much said now-a-days? and what most favours its production in the animal economy?

Dr.—Lithic acid is the transition stage into which fibrine, albumen, and gelatine, pass in their progress towards dissolution or assimilation. It is produced wherever there is an excess of azotised matters in the diet above the necessities of reparation, or beyond what the assimilating powers can appropriate. Hence it is largely generated in those who take an excess of animal food, and whose digestive functions are impaired. Gout and ordinary (urinary) gravel are the results of an excess of this acid in the system. It is detected in the blood, but it is often absent in the urine, till the action of colchicum favours its elimination by the kidneys. Its characteristic then appears very clearly under the microscope.

The more *digestion* and *assimilation* are weakened, the more the food is indigestible and unassimilable, the greater is the production of *lithic acid*, with *ammonia*, and other products of decomposition. Hence it is most common in people who attempt to combine full living with sedentary habits. Over-cooked meats, heavy pastries, rich cheese, strong acid wines, &c., favour its production.

P.—As you affirm that lithic acid is the *transition stage* in which fibrine, &c., pass in their progress to assimilation, may it not also be a *transition stage* of the decay of the tissues of the same fibrine after it has served its purpose as muscle, and is in process of elimination from the system?

Dr.—The source of lithic acid which you suggest is highly probable, from the fact, that during and after febrile and inflammatory irritation, in which there is great decomposition of the tissues, there is always a copious deposit of lithic acid salts in the urine. In fact, chemists suppose that the urea excreted by the kidneys is derived chiefly from the transformation of the tissues.

The carbon of the decayed corporeal structures is abstracted by the oxygen of the blood, and emitted by the lungs as *carbonic acid.* UREA is found in greater or less abundance wherever organic debility, or exhaustion of vital power occurs, as, for example, in youths growing rapidly, in persons weakened by great mental exertion, by want of sleep, or by excesses of the passions, in the passing of chronic inflammation of the stomach into acute, in typhoid fevers attended with great loss of flesh and strength, in acute rheumatism, and in delirium, at the decline of the acute symptoms.

P.—How does an excess of lithic acid in the system show itself? What are its morbid effects?

DR.—These are various. The kidneys are the great eliminators of the lithic acid. Pain, irritation, and hæmorrhage, are frequent results of the irritation of the tubular structure of the kidneys, by the crystals of lithic acid. It also frequently occurs that the aqueous and alkaline contents of the urine are insufficient to hold the urea in solution. In such cases it is deposited in the form of crystallised *sand*, or *gravel*, or *calculi*, in the kidneys or the bladder.

P.—Of course it stands to reason that this cannot take place without great irritation, or obstruction of the urinary apparatus.

DR.—So. A natural and just conclusion.

P.—But if the kidneys fail to eliminate the lithic acid, and its compounds accumulate in the blood, what is the result?

DR.—In such cases various irritative and functional derangements occur: for example, irregular flying gout, which at length explodes in an inflamed limb. This produces a crisis of pain and fever, which subsides with the removal of the *materies morbi*—a copious deposit of lithic acid in the urine. The more intense the inflammation, pain, and fever, the more abundant is the morbid excretion, and the more free from disease is the patient afterwards.

P.—What is the nature of those chalk stones found in certain gouty joints? In what kinds of the disease, or in what sort of subjects do they occur?

DR.—These plastery or calcareous matters are concretions of *lithate of soda.* They are met with in cases of gout of long standing or of frequent occurrence. The chronic gout is always associated with, or kept up by, protracted disorder of digestion and assimilation. It is the kind of gout that occurs in broken-down

subjects, in the intemperate, and in those who have neglected proper treatment. This is no doubt the reason why this form of the disease is much more difficult to cure than its acute forms which belong to robust subjects.

P.—From what you have said of these diseases, am I to infer that the condition of the urine is only a consequence of a constitutional fault, originating in disorders of the digestive organs?

Dr.—Most unquestionably. The great cause is *dyspepsia* and the *depraved nutrition* consequent thereon.

P.—Before you leave this subject, will you give me some account of that singular disease, DIABETES, which, I presume, is one of the family you have been describing?

Dr.—They own no doubt one common origin. Sugar, to be in urine, must first exist in the blood. The sugar of diabetes (grape sugar) *is* found in the blood, and is evidently elaborated in the stomach during digestion.

P.—Can you explain the production of diabetic sugar during digestion?

Dr.—There is no difficulty in its *rationale*, when you consider that starch and gum are isomeric with sugar, and easily convertible into it (in the laboratory) under the action of acids, and that a large amount of acid exists in the stomach of diabetic patients. The amount of sugar in the blood, is at its maximum during the process of chylification, and diminishes or disappears on fasting. In diabetes the other animal constituents of the urine are also increased.

P.—The sugar of diabetes, therefore, has no tendency to accumulate in the system, and to produce local effects like urea.

Dr.—It appears not. It acts as a powerful diuretic, carrying out of the body immense floods of water. This is the source of the atrophy, thirst, dry skin, and general cachexia, characteristic of the disease. To generate the quantity of water so drained off, usually far exceeding what the food or drink supplies, a rapid waste of tissues is necessary. In this way the plastic process is degraded, and products of low vitality are formed. Hence the cachexia or ill habit of body of the victims of diabetes, and their tendency to tuberculosis—in other words, the association of the malady with consumption.

P.—Other matters, I believe, than the altered principles of the food or the wasted elements of the tissues are found in the blood as *morbid poisons* of various sorts. What are their effects?

Dr.—Imbibed poisons undoubtedly alter the composition of the blood. They are supposed to be the material causes of various contagious, epidemic, and endemic diseases. The inoculated blood of measles will communicate the disease. The blood of a small-pox patient, injected into the veins of animals, produces violent symptoms and death. Glanders in the same way is propagated from one horse to another. The blood of a diseased animal, merely touching the lips, has produced blistering, pustules, malignant fever and death. *Pus* in the blood produces the most destructive effects.

P.—Are not cutaneous eruptions the throwing off of a *materies morbi* from the blood?

Dr.—Undoubtedly they are so in most cases. At the least, they are a *transfer of irritation*, and are therefore highly salutary in all internal maladies.

P.—Pardon me here. One word as to treatment. Is not elimination the driving out, or coaxing out of the system, by the natural outlets or safety-valves, these morbid matters, the grand *indication*, as you call it? You pointed out how, in this way, fevers were carried off, or a fit of gout subdued by spontaneous diarrhœa, diuresis, or perspiration. You see I am getting familiar with all your terms.

Dr.—Your observations are good. If these can be excited artificially, *without doing any injury by destructive stimulation of the internal structures*, you can hardly fail of cure. Now the broad line of distinction between hydropathic and allopathic treatment is this, that you cannot open these drains, or attempt to reduce irritation by drugs, *without excessive stimulation of these internal structures. The effect is equivalent to blistering the delicate sentient linings of the visceral surfaces and vascular walls.* It is the pre-eminent virtue and just boast of the water-cure treatment, judiciously applied, that it opens and scours out the body's natural drains *without this injurious irritation*, at the same time that irritation and chronic inflammation of the surfaces or solid organs are allayed. Ponder this. There is much in it.

P.—Bland water, bland food, *hot* and *warm* fomentations, poulticing of the *whole* body, gentle perspirations, followed by refreshing baths and ablutions, certainly do not sound like a system of excoriation and blistering. Thank heaven! this is indeed your strong tower of defence into which we poor patients

who know the secret run for safety from the pelting *mitraille* of drug medication. Some of us, as you know, sufficiently *riddled* with the shot before getting behind your bastions.

Dr.—Ah, my good fellow, drug medication is merciful compared to what it used to be when I commenced my medical career. But to conclude on this excretory function, let me mention one fact of great worth and interest, viz., that persons with diseased kidneys, or with habitually sluggish, heavy, and scanty renal secretions, are *peculiarly liable to contract infectious diseases.* In such a state of matters, also, medicinal poisons, as opium, arsenic, mercury, colchicum, are doubly dangerous, and more certainly distructive.

P.—This conveys a pregnant hint.

Dr.—Let us hope that some fine day it will be turned to a good account. So—*guten abend, schlafen sie wohl.*

CONVERSATION SEVENTIETH.

PATHOLOGY, OR THE NATURE OF DISEASE.

The part the blood plays in disease—Anæmia—Symptoms of bloodlessness—Nature's care of the nervous centres, her citadels—Rational and empirical remedies—The duty *of medical practitioners.*

Doctor.—To-day we break rather new ground. What has been considered are the separate elements whose aggregation or totality constitutes distinct diseases, or specific parts of disease. We have now to discuss the simpler of these compound principles of disease.

Patient.—When we see the machine put up, then we shall understand it all the better, for having commenced it in detail, for having seen, handled, and studied its pieces; a getting behind the scenes as it were.

Dr.—O patient! quick and discreet! you speak well and wisely. We shall now begin with the morbid conditions connected with excess or defect of blood in the vessels.

P.—You showed before of how great importance were the ele-

ments of disease included in the circulation of the blood. Clearly comprehending, as I now do, the subject of the blood and its constituents, the mechanism, the irritability, and tonicity of the organs concerned in its distribution, I am now prepared to profit by your instructions. I quite applaud the policy, as I hope to prove the efficiency, of the analytical plan you have adopted. Well, of this most important of fluids the *blood* as a whole? Pray go on.

Dr.—The morbid conditions connected with excess or defect of blood in the vessels, general or local, are attended with increase or diminution of the irritability and tone of the moving fibre.

We shall begin with *anæmia*. It is essentially *bloodlessness*, whether the result of deficient production, or excessive expenditure of blood. The deficient in quantity is always deteriorated in quality.

P.—What are the causes of anæmia?

Dr.—Whatever disorders the blood, whatever injures its constitution, or interferes with the formation of red particles, as excessive bleeding, hæmorrhages, profuse evacuations of fluids, containing much of the animal principles of the blood; food poor, scanty, deficient in proteine (animal matters); confinement in impure air, *dark* places, or malarious districts; long medicinal courses, especially of *mercury*, *iodine*, *alkalies*, &c. Chronic diseases, profoundly implicating the vital constitution of the solids and fluids, tuberculosis, cancer, granular kidney. Irregular uterine functions are associated with the commonest forms of anæmia.

P.—Whether as cause or as effect?

Dr.—There's the rub. I believe that in the infinite majority of the cases in question, the amenorrhea (suppression of the menses) is the effect of the general constitutional disorders. The impoverished blood and textures cannot now afford, for reproductive purposes, any drain for mere purposes of reproduction, when all nature can do is to hold together the life of the individual.

P.—It is not very likely, therefore, that in such circumstances she should show much anxiety to provide for the life of a new being. It is only abounding vitality that ordinarily imparts new life. The diseased or the dying are not usually prolific. I think, therefore, your hypothesis is much more feasible and likely than that the suppression is the cause at bottom.

Dr.—Yet I admit that, in a few cases, the sudden arrest in the

previously healthy or full-blooded, of the local drain, has been the starting-point of the constitutional infection. Facts I have met with require this remark. The pallor, or yellow and greenish hue of skin, shows clearly an injury done to the blood particles, and the powers by which they are repaired. Anæmia is symptomatic of many chronic and cachetic affections.

P.—What are *its* symptoms?

Dr.—They are such as imply depression of the great organic functions, and excitement of the nervous centres; viz., general muscular debility, faintness, breathlessness, and fatigue on exertion; weakness of the heart, shown in feeble thready pulse, and becoming irregular, failing or palpitating on the least effort; general feebleness of the circulation, as shown in a cold surface and extremities. The nutritive functions and the secretions of the stomach, liver, and bowels, are all wrong, marked by perversion or torpor of the appetite, disrelish of animal or nourishing food, craving oft for sour, innutritious trash, even chalk and cinders are eaten in extreme cases.

P.—I cannot wonder that under such circumstances the blood should be watery. What are the distinctive physical signs of this defective state of the blood?

Dr.—The skin, lips, gums, and tongue are pallid. Dark persons or sallow are of greenish-yellow hue; the fair complexioned are ghastly pale. The blood is transparent in the large veins, and is pink instead of blue. The thin blood, in its ill-filled vessels, gives forth sonorous vibrating murmurs, especially in the large superficial veins of the neck and of the heart. This you lately adverted to as the *bruit de diable*. The blood drawn is thin and watery, readily coagulating into a small contracted clot, which is usually covered with the buffy coat. The fibrine predominates over the red particles.

P.—These are all symptoms, I perceive, which indicate the feebleness of the grand organic functions. What are those you alluded to as indicating irritation or exaltation of the nervous functions?

Dr.—Acute sensibility generally, intolerance of light and sound, flashes in the eyes, noise in the ears, rushing in the head, neuralgic pains, *exaggerated reflex function*, spasms, convulsions, spasmodic asthma, vomiting, and sympathetic irritations.

P.—Are not muscular strength and nervous excitability incompatible?

Dr.—Yes, this kind of nervousness and weakness are synonymous.

P.—I wish particularly to have explained, how nervousness coincides with bloodlessness or bodily weakness.

Dr.—It is found that when the body is comparatively bloodless, the nervous *centres* retain a disproportionate supply. In all assaults upon the organism that endanger vitality, nature adopts this mode of self-preservation. She withdraws her means of defence from the less essential outlying parts to the grand citadels of life in the centre; for this central part is the true battle-ground in the struggle with disease. On the successful resistance it maintains depends the issue of the battle, life or death. In cases of great bloodlessness, if the heart's action be very feeble, it is incapable of propelling the blood through the brain. Hence congestion of the great veins or sinuses of that organ, producing giddiness, drowsiness, impaired mental faculties, obscured vision and dull hearing, partial paralysis, coma, catalepsy, &c. Sometimes fibrinous concretions or clots of blood form in the sinuses, obstruct the cerebral circulation, and interrupt its functions. Anæmic blood has a greater tendency to coagulate than healthy blood; for its fibrine does not diminish in proportion to the other animal constituents. From obstructions of the circulation that occur in this and other ways, dropsical effusion into the cellular tissue is a common result of protracted or aggravated anæmia.

P.—I should infer, that softening and wasting of the texture is a general result of a deficient supply of blood?

Dr.—Undoubtedly. Parts subjected to pressure waste because their supply of blood is cut off. From the same cause, softening of the brain and heart results from ossified arteries. A deficient supply of blood to glandular structures, lies at the foundation of the impaired quantity and quality of their secretions.

P.—Does defective nourishment produce anæmia?

Dr.—Not always. It will in all cases, if severe and long protracted. Defective nourishment reduces the weight of all the structures of the body, save the nervous system. This is the reason of the predominant activity of the nervous system in persons weakened by low diet, depletions, &c. I have just shown you *how* and *why* the *nervous centres monopolise the blood.*

P.—How does this deplorable state of things usually end?

Dr.—In extreme anæmia, sudden exertion may cause fatal syncope. Left to itself, it will end by *pure vital failure,* attended

with anasarca or dropsy, in the development of cachexia, tubercle, or cancer, or by irritation of the brain from concretions in the veins and sinuses, or by the gradual alteration of the nervous centres, determining paralysis, insanity, amentia, epilepsy.

P.—But when the case is not too far gone, and there are no grave organic complications, may not recovery be hoped for?

Dr.—Yes, and it is to be done by tact and skilful management under such a training or hygienic system as we practise. It is clearly not in the nature of drugs to spur on the languid organs, to replenish the exhausted blood, and replace the crumbling materials of a structure shaken to its centre and tottering to its fall. Assimilation is at fault. Tinkering or hammering of the body with *specifics* may aggravate, never remedy the mainsprings of the evil. The grand remedies are those, *firstly* which rouse the excretory functions, which open the locked portals of the liver, lungs, and skin, and let out the accumulated morbid matter of the body; *secondly*, then will follow a disposition and an ability to appropriate reparative materials, those which restore the deficiency of the red particles, the fibrine and the albumen of the blood, in the shape of nourishing diet, animal food, &c., pure air, copious *light*, and proper exercise; of course the treatment must be adapted to individual cases, and the food proportioned to the digestive powers. The water-cure can, as a *general rule*, afford to dispense with the many *so called* tonics, even iron. But you must bear in mind at the same time, that a *physiological practitioner* worthy of the name will not refuse as adjuncts, any medicinal remedies that are found sanctioned by reason or investigation.

And, moreover, let me add, that if he be a true man, he should not hesitate to go far and wide, barefooted if needs be, to seek and know any means promising to aid him in a calling so sacred, that of mediator between disease and health, indeed, I might say, between life and death. And never should it be absent from his mind, that on his skill and knowledge will often depend whether the result of a day will end in the silent tomb, or in the continued consciousness of heaven's cheering sunshine.

He is but a so-so doctor, believe me, who pooh-poohs every new or vaunted discovery he does not understand, fancying that abuse or sneers will suffice as an apology to his conscience for putting off the duty of learning or inquiry, a process mayhap so dreaded and unused by his rusty or faulty intellect. Or he may be held back by an instinctive dread that honest investigation might throw

unwelcome light on the clouded brain, and so display the neglect and deplorable deficiencies of an understanding so conventional, obscured, and *borné*.

CONVERSATION SEVENTY-FIRST.

PATHOLOGY, OR THE NATURE OF DISEASE.

Excess of blood—Plethora, its symptoms—Stuffing, and its price.

DOCTOR.—To-day we enter on the discussion of the morbid effects of *excess of blood* in the system or in any part of it; in technical phrase *Hyperæmia.*

PATIENT.—This "fatness of blood" as we call it, is a large and frequent element of disease, I presume?

DR.—When the excess of blood is general, it produces the condition known as *plethora.* If the vascular system is acting *above par*, if to the distension of the vessels and heart there be added an excess of irritability and tonicity, we have what is called *sthenic plethora.* If the reverse, we have *asthenic plethora.* In either case it may determine augmented secretions and exhalations, as hæmorrhages, fluxes (mucous discharges), dropsical effusions, &c.

When the excess of blood is confined to one locality, or occupies only one tissue, organ, or system, and if accompanied with *diminished* vascular motion, *congestion* is the result; if with *increased* vascular motion, *determination of blood* follows; and if with partly increased and partly diminished movement of the vessels, we have *inflammation.*

P.—*Plethora*, then, you would define as the blood-making process carrying it above the blood-wasting powers.

DR.—Yes, a want of balance between the production and the expenditure of blood.

P.—The production must be relative to the waste, the waste to the production.

DR.—To constitute and retain health, it clearly must be so. Up to a certain point, it is usually associated with high health, and

with freedom from any marked local disorder. The face is red, the veins distended, the pulse full. But a step beyond that, let anything occur to derange the nicely-adjusted balance, and the blood accumulates in, and unduly distends the heart and blood-vessels. Palpitation and shortness of breath, an indisposition to exertion and somnolency set in, and the individual stands on the brink of the gravest disorders. The state of plethora may reach this bursting-point without any function or organ materially failing. Then a secreting organ, perhaps, suddenly comes into action, a natural vent or safety-valve is opened. Diarrhœa, or a hæmorrhage from the nose, or bleeding piles, or a free discharge of fluids by any outlet, relieves the system of a load, that might be otherwise fatal. If this secretion occurs in a closed cavity, or implicates a vital structure, as in cerebral or pulmonary apoplexy, then sudden death may ensue; or, in this great need and hard put-to of nature, a safety-valve gets obstructed and will not work, an indispensable excreting organ, as the skin, liver, or kidneys, fails in its functions, and we have a fever, a bilious attack, jaundice, gravel, or gout.

P.—These maladies interrupt the distending process?

Dr.—Yes; and what is better, they rouse the doomed patient from a false security, a fatal repose—if he will but attend to the salutary hint of nature, admonishing him to "pull up" in time. They have the effect, temporarily at least, of *forcing* him to adopt a saving discipline; and they postpone, if they do not avert, the natural and necessary results of plethoric tension, viz., an *apoplexie foudroyante*, or organic disease of the heart, an aneurism of its great vessels, or fatal disorder of the lungs, kidneys, or liver.

P.—Good heaven! Doctor, your description makes me nervous; who would *gormandise* at this price? Let any man going to a feast hear this, and if he be "a man given to appetite," he will sit at table as if a drawn sword were suspended by a thread over his head.

Dr.—Men may be *startled* for awhile, but the many will return like a sow to her wallowing again in the mire. Know you not that

"*All* men think all men mortal but themselves,"

as truly said by Young in his *Night Thoughts*, a book once my constant and fitting companion, when, like himself, the suffering victim of a morbid ideality, heart-burn, acidity, and perpetual dyspepsia.

P.—I know that vows made in pain are easily recanted. But, tell me, are the dyspeptic subject to plethora?

Dr.—The majority are not, but a great many are, notwithstanding, and theirs constitute the worst cases of plethora. They are the most subject to those fearful awakenings from their fancied security, which I have just painted.

P.—Plethora, I should suppose, is most frequently induced in the robust, who live well, who take (tuck?) in large supplies?

Dr.—And who give out (excrete) little—who take insufficient exercise. In fact, whatever reduces the expenditure of the system, the blood-making process being the same, will induce plethora, as the cessation of the drain of an issue, diminished excretions of any sort, especially the sanguineous.

P.—You said that the different degrees of the strength and irritability of the muscular fibre, its excess or defect modified the effects of excess of blood, inducing in the former case sthenic plethora, in the latter, asthenic plethora. Who are the subjects, and what are the symptoms, of sthenic plethora?

Dr.—The *sthenic plethora* affects the young, the active, the sanguine, whose nutrition is abundant, whose blood is rich. It tends to febrile excitement, to active hæmorrhages, fluxes, and inflammations. The same *law* that makes functions vigorous and high-toned, in proportion to the quantity of blood which their organs receive, makes their morbid deviations to be characterised by the same intensity of action. In sthenic subjects the heart's action and the arterial pulse are strong and regular; the muscular contractions are powerful, the sensibilities acute, the animal heat abundant, the secretions copious. This is the acmé of the healthy energies of mind and body. Beyond this, plethora verges into disease. The action of the heart and vessels is excessive, the pulse strong and hard, the face flushed, the heat feverish; the secretory activity runs into hæmorrhage, or inflammation sets in. A bilious attack, diarrhœa, lithic acid gravel, strong acid urine, symptoms of sthenic gout, &c., are explosions of this pathological state. The nervous centres are either over-excited by the rapid flow, or oppressed by stagnant inturgescence of the blood.

P.—But is not the deposit of fat a safety-valve to the plethoric?

Dr.—Yes, *for a time.* As the heart and blood-vessels sustain the brunt of this prolonged organic and functional excitation, they are the first to exhibit organic alterations—as hypertrophy, valvular disease, aneurism, ossification, steatoma, atheroma, &c.

P.—From its name I should suppose the asthenic plethora is associated with symptoms of depressed or oppressed functions? Please to describe this condition, and state who are its subjects?

Dr.—It is characterised by defect of tone and contractility in the moving fibre, and by a load of blood which oppresses, but does not excite, the heart. The pulse is full, but slow and irregular. There are faintness, palpitations, and dilatations of the cavities of the heart, by the pressure of blood it cannot propel. The face is purplish, the veins distended, the extremities cold. Irregularity, sluggishness, and imperfection attach to all the functions. The urine is scanty, high-coloured, turbid. The sensibilities are blunted, the intellect dull. There is lethargy, somnolence, reduced strength, and depressed spirits. This pathological state disposes to worse—to congestions and passive hæmorrhages, to fluxes and dropsies; if unchecked, to dilatation of heart, varicose veins, enlarged liver, to congestion of brain, headache, apoplexy, and palsy. Sometimes, in these cases, a reaction follows, producing the symptoms of congestive fever, namely, quick irregular pulse, skin hot but moist, sickness and vomiting, tongue furred and dry, the intestinal secretions scanty, offensive, and altered in colour; the face dusky, the eyes suffused, the mental faculties clouded, delirium, or lethargy.

P.—Are not these like the symptoms of the operation of a morbid poison as retained or perverted secretions in the blood?

Dr.—Certainly; and with *engorgement* and a high state of *irritation* of the *mucous membrane*. Turgid blood-vessels, impaired secretions diseasing that blood, are an evident cause. The simple slackening of the blood current prevents *purification* and *excretion*, thus charging it with decayed matters that should have been eliminated, still farther increasing the morbid condition of the sentient surfaces. Hence the blood is loaded with urea, lithic and lactic acids, and other used and noxious materials which poison the vital streams and fountains, while they *irritate* the solids.

Asthenic plethora affects persons weakened by age, or by excesses, and those whose excretory organs act imperfectly.

CONVERSATION SEVENTY-SECOND.

PATHOLOGY, OR THE NATURE OF DISEASE.

Congestion general and local, what they consist in—Difficulty of removal—Phenomena of congestion—Hypertrophy—A word about remedies.

DOCTOR.—TO-DAY we enter on the important subject of CONGESTION, called, technically, *local hyperæmia.*

PATIENT.—*Congestion*—that is a familiar and interesting word. How do you define it?

DR.—Thus. *An excess of blood in the vessels of a part, diminishing the action of those vessels, distending their coats and slackening their current.*

P.—Congestion, then, means simply *engorged, dilated, unduly distended vessels*—a sort of stagnation?

DR.—Yes; the elasticity and tone of the vascular coats are overcome. As blood accumulates in a part, of course, its motion must diminish. The chief source of movement, you will recollect, is the force from the *heart.*

P.—What are the causes of this local excess of blood?

DR.—Two, principally. 1st. Obstruction of the veins, which prevents the free passage of blood. 2nd. Atony of the vessels (the capillaries and veins), from sheer weakness of their coats, distended beyond measure and beyond recovery, by the pressure of blood.

P.—Give me an illustration of congestion from venous obstruction. One hears now-a-days so much of congestion of the brain?

DR.—You see it in the livid, swollen condition of an arm, when bandaged for venesection; the permanent chill of a limb, or of the surface of the body, by long exposure to cold (that is without reaction), contracts the veins and congests the capillaries.

P.—Evidenced, I presume, in the purple colour the skin then assumes?

DR.—Yes. Cold, also, impedes the circulation by increasing the adhesion of blood to the walls of tubes (Poisseuille.) Obstruction of the veins leading from an organ causes the congestion of that organ. Thus pressure on the jugular vein congests the head.

P.—That accounts for the livid countenance of people killed by hanging or strangulation?

Dr.—Yes. In the same way, any cause impeding the flow of blood through the lungs, as coughing, an asthmatic paroxysm, valvular disease of the heart, &c., congests the lungs, heart, liver, jugular vein, and head—all the parts, in short, from which the tribute of blood is flowing into the right side of the heart. Obstruction of the portal system congests the abdominal viscera, augmenting the intestinal mucus especially, and disposing to hæmorrhages, &c.

P.—Give some instances of congestion from atony of the vessels.

Dr.—This may be *general* or *local*. Of the first kind, you have an illustration in the debility of the whole system in typhoid fevers and in the sinking before death. In these cases, the heart's force is too feeble to propel the blood through the whole circuit of the vessels. *Local* congestion is of very common occurrence. The structures most destitute of tonic fibres, as the veins and capillaries of the solid viscera especially, yield most, become most readily congested. Hence we have the blood accumulating by simple gravitation in the weakened vessels of low depending parts of the body, as in the posterior portion of the lungs, intestines, and integuments in patients who have lain long in the recumbent position.

P.—I presume the overstretching of the vessels by the force of the gravitating fluids, weakens and relaxes their coats permanently?

Dr.—It does; just as the feet swell in certain people after long standing or walking. Continued stooping, even temporary stooping, sometimes will congest the brain, producing headache, giddiness, confusion of vision, noise in the ears, even apoplexy, in the predisposed. Long standing, sitting, or lying will congest the liver, uterus, and hæmorrhoidal veins, especially in cases where there is weakened circulation, from weakened tone of the system generally, and of the vessels particularly. Yet these results of simple debility have often been regarded and treated as pure inflammations. How pernicious depletion must be eventually, although affording a delusive temporary relief; and how beneficial the tonic discipline of the local astringent agencies of the *water-cure* is, *you* can now easily conceive.

P.—May not the vessels permanently lose tone from temporary over-distension of their coats, just as a bow too long kept on the stretch?

Dr.—I have no doubt of it. You see this illustrated in the ope-

ration of cold as a cause of disease. The constriction thereby of the vessels of the surface and extremities tends to throw the blood inwardly, producing accumulations in the interior organs, congestion of the lungs, liver, kidneys, *mucous* and *serous membranes.* If these continue long the vessels permanently lose tone. Warmth will not restore the circulation to the surface; *combined frictions and baths*, and all the constitutional adjuncts of treatment will often take months to relieve or cure visceral congestions thus induced. These visceral congestions lie at the foundation of many functional disorders, and pave the way for inflammation and *organic disease* in various forms.

P.—I suppose the cold stage of malarious fevers, and that of other miasms, operates like external cold?

Dr.—Precisely so. The congestions and enlargements of the liver and spleen are natural and necessary results. Congestion remaining induces *inflammatory complications.* Over-excitement of vessels is also a cause of congestion, as is seen in their persistent dilatation after inflammation. This is seen on the skin after the operation of a blister. It is familiar in the eye and throat; and also in the *stomach* from *stimulant liquors* and *drugs.*

P.—But may not congestion result from the application of irritants without inflammation?

Dr.—Yes. A stimulant liquor applied to the web of a frog's foot contracts its vessels, especially the arteries. This is quickly followed by their enlargement; then a *gradual* return to their natural calibre. If the irritation be kept up, the *arteries* shrink, but the *capillaries* and *veins* remain congested, gorged, and paralysed. The capillaries and veins, not having the same contractile fibres as the arteries, thus more readily lose tone, and remain dilated.

P.— I see a microscope on your table there. Let us see what changes take place within the living vessels.

Dr.—Look now, and you will perceive in the web numerous pale corpuscles clearly to adhere to the sides of the vessels, and obstruct the current. The liquor sanguinis passes on. This obstruction is in proportion to the degree of the stimulus, till perfect stagnation occurs, with deep red colour of the congested part. But there is a difference among observers as to the precise microscopic phenomena.

P.—What is the effect of congestion in secreting organs or surfaces?

Dr.—To diminish or to suspend the secretion according to the intensity of the congestion.

P.—To restore or to augment secretion, then, the first thing you do is to remove congestion?

Dr.—It is vain to attempt, permanently and normally, to increase secretion without removing congestion. It cannot be done.

P.—But does not the free flow of a secretion unload the distended blood-vessels?

Dr.—Of course it does. The restored freedom of the circulation is the only condition to perfection of the secretory process.

P.—In what relation does congestion stand to asphyxia?

Dr.—They are inseparably associated. The former is the natural and necessary consequence of the latter. Imperfectly aërated blood accumulates in the right side of the heart, and in the venous system generally.

P.—I should like now to know what are the phenomena of congestion, its symptoms and effects.

Dr.—It is a *law* that defective circulation always impairs the vital properties of the structures implicated therein. This is exemplified in the numbness, coldness, and weakness of a limb whose vessels have been obstructed by a ligature. Pain and tenderness, spasms and morbid sympathies accompany it; but much less in degree than in the case of determination of blood in inflammation. Congestions of the brain, heart, stomach, liver, kidneys, or uterus, and other organs, occasionally produce nausea, vomiting, altered appetite. These are, perhaps, as often, or oftener, absent. The spleen and liver are often enlarged without pain. Impaired nervous, muscular, and secretory functions are, perhaps, the most constant concomitants. The *natural* secretions of congested parts are, in the first instance, diminished, as in the congestion of the bronchi (dry catarrh), liver, and kidneys. The distended capillaries, however, generally relieve themselves by the effusion (secretion) of watery, saline, and albuminous matters, sometimes even fibrine, with a mingling of the natural secretion. We have this exemplified in the exudation of dropsies and fluxes. In congestion of the kidneys, we have watery and albuminous urine; in congestion of the lungs and pleura, hydrothorax, or water in the chest; in congestion of the heart, hydropericardium; in congestion of the abdomen, ascitis, or dropsy of the belly. In congestion of the bron-

chial, intestinal, and uterine mucous linings, we have copious mucous discharge, bronchorrhea, diarrhœa, dysentery, leucorrhea, &c. These chiefly characterise acute attacks, or are the *finale* of long standing cases.

P.—The great pathological element of these effusions, then, you make it out is distension of the vessels?

Dr.—Yes; and often occurring under comparatively vigorous states of circulation.

P.—You also before intimated, I think, that the opening and unloading of the pent-up vessels, by the escape of these discharges is a precaution of nature to save the individual from the grave risks of hæmorrhage or inflammation. I infer, therefore, that there is more than simple distension concerned in the case, but that the condition and qualities of the blood considerably influence the results. Am I right?

Dr.—Your recollection is perfect: your inference just. The character of the effused fluids is determined by the nature of the blood. For example, where the blood is poor, the watery parts easily transude through the coats of the congested vessels. Where the blood is richer in fibrine and albumen more pressure is necessary for their effusion. This is the origin of the fibrinous and gelatinous concretions in the lymph effused in the pericardium, pleural and peritoneal cavities, and especially on the coats of the liver (*the fibrinous dropsies of Vogel*). The polypus concretions and pseudo-membranous films effused on mucous surfaces, as the bronchial moulds from croup, for example, arise from the same congestive tension, with a highly fibrinous condition of the blood. The same is the source of the animal matters, albumen, or mucus, that abounds in bronchial, urethral, and uterine fluxes.

P—The plastic products of congestion are modified by the composition of the blood, by inflammations, &c.?

Dr.—Precisely so.

P.—You intimated before that albuminous urine arose from congestion of the kidneys?

Dr.—Yes; granular kidney in its earliest stage presents a highly congested structure. In the progress of the disease, the vessels become obstructed by a deposit of fibrine (with granular cells), pressing, not only on the blood-vessels, but on the uriniferous tubuli, in the end superseding their proper secreting structure.

P.—So that the doctrine you establish is that congestion, if per-

sistent, alters the nutrition and structure of the organs, causing the deposit in excess of plastic materials?

Dr.—True, and this textural alteration is what is commonly known by the name of Hypertrophy.

This intervascular deposit or effusion of lymph from congested vessels while soft is illustrated in "the granular kidney," as I have noticed, and in the nutmeg liver (cirrhosis). It afterwards contracts and compresses the natural structures, causing its condensation and atrophy. The new deposit itself forming a granulated or modulated tissue of low vitality. The variation of these products are referrible to the stages at which they have arrived, and the extent of structures they have involved. In cases of long standing disease of the heart, opaque thickening, the result of an overflow of nutritive matter from the vessels, is often met with in intervesicular and interlobular structure of the lungs. Also in the membranes of the brain, liver, and spleen, and along the course of the arteries and veins.

P.—Congestive viscera must be increased in weight?

Dr.—They are so, especially the lungs, and liver, and spleen (ague cake).

P.—What are the general effects or constitutional phenomena of *local congestion?*

Dr.—It is plain that an excess of blood retained in one organ will rob other parts of the body, especially the limbs and surface, of their due share. Thus congestion of any vital organ to any extent, as of the liver, lungs, brain, stomach, &c., produces paleness and chilliness of the surface, weak small pulse, cold extremities, langour and inertia of the functions generally. In extensive congestions, suddenly induced, as in the cold fit of ague or cholera, *reaction* ensues, causing quickened circulation, hot skin, and other phenomena, symptomatic of fevers.

P.—The object of this you before described was nature's expedient for restoring the lost balance of the circulation, to roll back the sanguineous current from the centre to the surface. What if this object fails, if reaction be weak or null, if the congestion be unremoved?

Dr.—A low remittent, feverish excitement ensues, till a crisis by sweat, urine, or diarrhœa terminates the congestion. If no reaction follows, the patient must inevitably sink.

P.—The stagnant blood of a congested interior organ being un-

aërated, uncleansed, must become noxious in composition and unfit for vital purposes?

Dr.—Most clearly. It is a source of contamination to the rest of the blood, a cause of general cachexia. This is seen in the slow poisonous operation of malaria in those continually exposed to its influence, also in the slow apyrexial (unfeverish) congestion that precedes typhoid pneumonia. Persons suffering from chronic visceral congestions pass loads of vitiated secretions (without fever).

P.—Proving an immense decay of the animal fluids, I presume, in consequence of their imperfect purification?

Dr.—I perceive you perfectly understand the matter.

P.—One word about remedies, and then we conclude for today. You said that it was vain to attempt to restore the secretions of a congested organ without first relieving the congestion. In that case are not irritant drugs to rouse the secretory efforts of loaded organs more likely to aggravate the evil?

Dr.—Certainly, they often do make matters worse. The prime object is to reduce *irritation* and vascular distension, and then, *generally*, afterwards they are not needed. Herein you will find the teaching of Brossais invaluable. There are cases, however, in which drugs are powerful adjuncts to the water-cure, and should not be dispensed with. You must make a distinction between their *use* and *abuse*. I hope you take it for granted that it is their ignorant reckless abuse so long prevalent, that I denounce. Extremes should be guarded against as a sacred duty. There are men who would die, or let others perish, rather than prescribe a glass of brandy or a dose of castor oil; both worth any money in time of their need. Another would have you live *al fresco*, and return to nature and raw turnips, denouncing our delicious roast mutton as "offal," and all shelter and precaution from weather as the *fons malorum* of all human ills and degeneracy. These are no innocent fancies, but often lead to grave results. A robust healthy boy suddenly falls ill with scarlet fever, the attendant, at the time riding furiously this aërial hobby, is called to the patient in the dead of night, in gasping haste throws open the window at the head of the bed, *and leaves it open*, the night being *cold, damp, and the rain drizzling!* The eruption that was coming out beautifully, as a matter of course was driven in, and before a day was passed, this fine boy had ceased to breathe. There are sins of omission as well as commission. These persons, whether they be *amateurs*

of doctering (or its profits), or regularly educated medical men, who will not correct this fault, truly deserve to be placed amongst the *class dangereuse.*

CONVERSATION SEVENTY-THIRD.

PATHOLOGY, OR THE NATURE OF DISEASE.

Determination of blood—Its physiological causes—Difference between congestion and determination of blood—Symptoms of determination of blood.

DOCTOR.—To-day we discuss the subject of DETERMINATION OF BLOOD.

PATIENT.—Rather a popular topic, at least one of the household words, familiar in men's mouths.

DR.—And very little understood. However, before I conclude, I hope to instil into you some accurate and practical ideas thereon. Determination of blood implies the excess of blood on a part with increased motion. It lies perhaps at the foundation of all diseases, and occurs as a part of the complex process of inflammation. You have examples of local determination of blood in health, to the face and neck in flushing, to the uterus and breasts in gestation and lactation, to the gums in dentition. For an example in disease, take determination of blood to the head. The augumented quantity and motion of blood in the part is shown by the increased size of the vessels, the redness, and the force or impulse, the stronger or throbbing pulsations.

P.—What determines this increased afflux of blood to a part?

DR.—Local stimulants in one class of cases. Heat causes a flow of blood to the surface; snuff, to the nose and eyes; sweets, or salts, or spices, to the mouth; food, to the stomach and its secretory apparatus; purgatives, to the intestinal canal.

This is a very pregnant fact regarding the *modus operandi* of medicines, that they cause (by their irritation) an increased flow of blood to particular organs and surfaces.

P.—What is the physiological cause of the determination of blood?

Dr.—*In the first place*, inordinate action of the heart. This *tells* chiefly on parts near the heart, when there is little blood in the system, and that little accumulated near the heart. We have thus determination to the lungs, bronchi, neck, and head, in commencing reaction after great congestions of internal organs, as in the beginning of the hot stage of fevers.

In the second place, local determination of blood takes place without increase of the heart's action. The action proper to an artery is tonic contraction. This diminishes instead of increasing the volume and impulse of the blood proceeding to a part. This tonicity of the arterial coats is the resisting influence to the successive waves of blood pumped into them by the heart. If the tonicity, then, of an artery is impaired, the pressure of the *vis a tergo*, of course, *tells* more upon it—its walls yield, the channel of the blood is enlarged.

P.— In that case, the consequence must be that more blood is admitted with more force ?

Dr.—Precisely so. Direct observation here corroborates what theory affirms, viz., that enlargement of an artery causes determination of blood. The capillaries and veins leading from the enlarged artery are also enlarged, and participate in the augmented volume and impulse of the blood. The arteries leading to an inflamed or irritated part are enlarged and distended. The coats of the vessels being stretched to tightness, they lose their usual elastic spring, and, of course, the blood current loses its soft undulations. The pulse is, therefore, increased in volume and harder in quality.

P.—I am, then, from this to understand clearly that *enlargement of the arteries, and enlargement of the capillaries and veins, with augmented volume*, and accelerated impulse of the circulation, are the essential elements or features of *determination of blood* ?

Dr.—You have exactly defined it. Having this clear understanding of the matter, you will find of how great use are some of these preliminary or fundamental ideas in comprehending the *modus operandi* of the water-cure. The contraction of arteries, and the consequent reduced quantity, speed, and impulse of the blood in the vascular plexus is promoted by the repeated application of cold water, which tends so to contract the arterial coats as to diminish the calibre of the tube considerably, and *pro tem.* almost to stop its current if required; giving tone at the same time to the nerves. A solution of metallic salts may do the same; *but*

never with impunity to the constitution, because they are intruders, foreign elements, to all intents and purposes, poisons to the fluids, irritants and destructives to the solids.

P.—Am I right, then, in understanding the difference between determination of blood and congestion to be this: in the former, the vessels enlarged are the arteries, with augmented motion; in the latter, the vessels enlarged are the veins and capillaries, with diminished motion?

Dr.—Yes; in *congestion* the accumulated blood is comparatively stagnant, because the vessels have no propulsive power in themselves, are a degree removed from the prime source of motion, and moreover receive their impulse through arteries that are not enlarged, that are not even contracted. In *determination of blood* the vessels are charged with propulsive power, are near the prime moving power, the *vis a tergo* impulsion of the heart and arteries.

P.—Have the arteries a power of active dilatation?

Dr.—Unquestionably not. Except in rapid growths, as we see in the deer's horn. The dilated artery I am discussing is that whose tone is weakened, so that the coats are passively distended by the *vis a tergo* of the heart and arterial contractions. In some cases this weakness is the result of exhaustion from excess of stimulus, as is seen in the subsidence of vascular action excited by the introduction of alcohol or opium into the circulation. *Tonicity*, or the lowest form of muscular irritability, I before showed is not a property derived from the nerves, although much controlled by them. The suspension of nervous influence, as in blushing, will take away tone from the coats of the capillaries, and will put them, in fact, in the atonic state of paralysed muscles.

Dr. Billing conceives that the contractility of the vessels is derived from the nerves, that by stimulating the nerves, their influence is withdrawn from the vessels; and, therefore, the contractility of the latter impaired. But this is a mistake. Contractility is not so derived. The nerves, however—especially the sympathetic nerves—are evidently concerned in causing determination of blood. Strong mental impressions acting through the nerves paralyse the sphicters and muscles of voluntary motion. The *modus operandi* of blushing may hence be conceived. The effect, however, of irritation on the parts where it is applied, is to cause determination of blood, on the sound principle "*ubi stimulus ibi affluxus.*" There is both a greater momentum and a

larger current of the blood, indicated by augmented heat, colour, sensibility, secretion, and nutrition.

P.—May not determination of blood to a part be produced by causes operating at a distance from that part?

Dr.—Yes; external cold may cause internal determination as well as congestion. By constricting the vessels of the surface and extremities it determines inwardly the course of the blood, causing palpitation, dyspnœa, pain and heat in the head and stomach. In proportion as people are of irritable fibre, and with scanty or impoverished blood, are they liable to these determinations of blood from cold. Flushing of the face and head, with cold feet (in a warm room), are signs of thin blood and gastric irritation. This symptom is very commonly met with in people subjected for some time to rigid vegetarian diet. The cure is a return to a more fibrinous and succulent diet. In patients of weak circulation, the local determination of blood is often accompanied by shivering fits, pallor, cold extremities, and defective secretions.

This toneless dilated state, with unusual pulsatory movement, often occurs in the great vessels and heart; constituting palpitation, and the inordinate abdominal pulsations common in nervous people, especially in connexion with hæmatemesis, in nephralgia, hæmaturia, and other affections of the urinary organs.

P.—What are the symptoms and effects of determination of blood?

Dr.—It exalts the heat, contractility, and sensibility of the part affected, exciting spasm, pain, irritation, and sympathetic disorders. It augments the secretions, and diminishes absorption. Hence it produces dropsy in the closed cavities and cellular structure. Repeated determination augments permanently the nutrition of a part, producing the state called *hypertrophy*. This we see exemplified in muscles much exercised, as in the leg of the opera dancer, or the arm of the blacksmith.

Persistent determinations of blood produces other disorders, as increased excretions of the watery, saline, or albuminous portions of the blood, or they pass into inflammation. Glandular organs long the seats of increased excitement in this way, degenerate in structure. Albumenuria or granular kidney is a result of this nature. Its essence is a congestive or inflammatory condition of the kidneys, which modifies the plastic conditions of the blood by draining off its albumen.

Determination of blood produces in remote parts of the body

coldness and deficient circulation. To this, if it be intense, febrile re-action succeeds, viz., hot skin, accelerated pulse, scanty secretions, and other symptoms of inflammatory fever.

P.—What are the parts most subject to determination of blood?

Dr.—Those nearest the heart, the heart itself, and the parts most freely supplied with blood-vessels, as the brain, glandular structures, mucous membranes, skin, &c.

P.—We hear the phrase "*determination of blood to the head*," in every mouth. What are its cause and symptoms?

Dr.—The most frequent are mental excitement, violent exertion, stimulant liquors, defective excretions. Its symptoms, when occurring merely casually, are throbbing of the carotid or temporal arteries, flushing of the face, suffused eyes, increased on stooping or lying with the head low. Its more persistent forms light up irritation in the nervous centres. We have then painful throbbing in the head, excessive sensibility to light and sound, flashes in the eyes, noise in the ears, excitement of mind, rapid ideas, delirium, wakefulness, dreamy sleep, restlessness, irritable temper. A grade further in these symptoms, and we have temporary oppression or obscuration of the nervous functions, giddiness, drowsiness, stupor, imperfect sight or hearing, specs or mists before the eyes, impaired articulation and locomotion, hysterical, epileptic, or convulsive affections.

P.—So that determination of blood produces the opposite symptoms of excitement or depression. What does this depend on?

Dr.—On the degree of the excitement. If the excitement is moderate, as by agreeable exercise of mind or body, or the gentle stimulus of tea or coffee, we have then an augmented but moderate and equable flow of blood to the brain. Excessive excitement inordinately dilates the vessels. There is a more impulsive, but less free circulation of blood. The force of the *vis a tergo* is expended on the larger vessels, and the consequence is langour of circulation in the distant and smaller branches. Hence the functional inactivity of those parts. In the case of the brain, there is a still more pertinent reason for immoderate determination of blood, producing stupor, &c., viz., the vessels there ramify in a soft pulpy state, enclosed in the hard unyielding skull-cap. The distension, therefore, of vessels so embedded by the augmented influx and impulse of the blood must have the effect of compressing the cerebral substance. In such a case the small veins will

be most obstructed, and the functional activity of the parts decline.

P.—I am quite satisfied, *grazie tanto.* If you can muster any more, give me some other illustration of determination of blood; I find it highly interesting.

Dr.—Diurectic drinks cause a determination of blood to the kidneys, not only augmenting the flow of fluids, but the excretion of acid matters, and of the epithelial cells of the tubuli uriniferi. Excitement of the circulation by exercise determines to the skin, evaporating the fluids of the body in perspiration. If this fails, the determination of blood is towards the kidneys. Some nervous attacks (as hysterical convulsions) are wound up by a determination of blood to the kidneys, producing a copious flow of limpid urine. External cold, by constricting the vessels of the surface and extremities, determines the fulness and force of the internal organs, as the kidneys, mucous membranes, womb, &c. Determination to the intestinal mucous membranes, as shown in pains, heat, nausea, distension, pulsations, in acrid secretions, or simple mucous discharges. It is produced by irritant ingesta as well as external cold.

The phenomena and results of excess of blood, plethora, congestion, and determination, are best exemplified in hæmorrhages, fluxes and dropsies, which subjects we shall take up in succession in our next conversation.

CONVERSATION SEVENTY-FOURTH.

Hæmorrhage—Its causes—States of blood that favour it—The red particles, how do they escape?—Varieties of hæmorrhage, symptoms and effects.

Patient.—From the conclusion of our last conversation, am I to infer that some general or local excess of blood always disposes to hæmorrhage, or lies at its foundation?

Doctor.—You are quite right. The various ways in which that excess disperses itself, or finds vent, are determined by the

modifications under which that excess appears. *First*, general plethora often relieves itself by bleeding from the nose, stomach, and lower bowels, piles. *Secondly*, congestion from venous obstruction produces "*pulmonary apoplexy*," from valvular diseases of the left side of the heart obstructing the pulmonary circulation. Bronchial hæmorrhage and spitting of blood are often results of tubercles in the lungs. Hæmatemesis, bleeding from stomach, and bleeding piles, are caused by obstructions of the liver (gorged portal system). *Thirdly*, atonic congestion produces the passive hæmorrhages of weak people, and hæmorrhages in depending parts in congestive fevers, the stooping posture causes apoplexy, the erect posture, uterine hæmorrhage. *Fourthly*, congestion of the head, often the inward determination produced by outward chill of the body, produces bleeding from the nose and apoplexy. The congestion from irritation of the stomach and kidneys in drunkards causes bleeding from these parts. Drastic purgatives produce bloody dysentery.

P.—Does general or local excess of blood necessarily result in hæmorrhage?

Dr.—No; not necessarily. The determining circumstances are: 1st, the condition of the blood-vessels; 2nd, the state of the blood. Disease of the blood-vessels may make them inelastic and brittle, as from bony, or atheromatous deposit, or from aneurismal varix, dilation. In these cases they easily rupture by congestion or inflammation. But simple inflammation alone will make the vessels soft and lacerable. From this cause we have often hæmorrhage occurring in the inflamed stomach or colon, in tubercular lungs, in softened brain, in diseased womb, or bladder. It is generally chronic ulceration that opens the vessels in malignant diseases of the stomach, intestines and uterus. Mechanical injury, as lifting a heavy weight from a height, which action violently compresses the liver, will bring on bleeding from the stomach (hæmatemesis).

P.—What states of the blood favour hæmorrhages?

Dr.—Blood deficient in fibrine, but abounding in red particles, as in petechial fevers, congestive apoplexy, hæmorrhagic small-pox, and other exanthemata. In purpura and scurvy—diseases marked by the hæmorrhagic tendency—there is no defect of fibrine, or excess of red particles; but undoubtedly there is an alteration of the quality of the fibrine and red particles. There is a want of vital contractility and plasticity in the fibrine. In in-

flammation or congestion in these cases the colouring matter of the blood oozes out, and stains the texture.

P.—How *is* the blood effused in hæmorrhages? that has always been a puzzle to my non-professional mind.

Dr.—A very pertinent question—more difficult to answer than to ask. For my part, I believe, that in a great majority of cases the blood-vessels do not give way—that the blood is effused after the supposed manner of *secretion*. Sometimes rupture of the vessels is found; but oftenest there is no discernable breach of vessels or surface.

P.—How then do the red particles escape without rupture of the vessels, or their own rupture?

Dr.—Another difficulty; if you should be made an examiner of examiners, how many would you let pass? The escape of the red particles, on the supposition there is no rupture of the vessels is certainly difficult to conceive of. There are no visible pores in the walls of the blood-vessels. The red particles, we must admit, are flexible and extensible, and may alter their shape. The appearances of cerebral apoplexy (capillary hæmorrhage), and of hæmorrhagic inflammation of serous membranes, evince many minute vessels ruptured at once. Perhaps the condition of the blood is altered.

P.—I suppose the varieties of hæmorrhage and the specific effects they produce, correspond with the varieties of constitution they occur in?

Dr.—Nearly so. They may be divided into two great classes, the distinction between them being based on the excess or defect of the contractile power of the heart, and of the tonicity of the arteries. We have, therefore, first, the active or *sthenic* hæmorrhage; and second, the passive or *asthenic* hæmorrhage. The former is produced or accompanied by symptoms of sthenic plethora, or active or sthenic determination of blood. Hæmorrhages in connexion with asthenic plethora (or with simple congestion) are *passive* or *asthenic*.

Hæmorrhage leaves behind it a peculiar jerk of the pulse, an abrupt morbid contractility of the heart and vessels, by which they may be recognised. This abnormal tonicity of the heart and vessels arises from the diluted blood at once lowering the usual stimulus, and degrading the muscular tissue. It induces various degrees of faintness and weakness, according as the effusion is large or small. The pulse becomes small, weak, and irregular; the surface and

lips pale, and in excessive loss, or in delicate people, from a very scanty loss, consciousness fails. After a few hours of collapse, reaction returns, and may renew the hæmorrhage. If hæmorrhage be suddenly checked by styptics, before the vascular fulness has been reduced, it may determine inflammation, strong, hard, jerking pulse, hot skin, &c.

P.—I suppose, then, you would call hæmorrhage one of nature's grand remedies, or shifts, to save the individual, when there is excess of blood in the system?

Dr.—When it arises from excess of blood, of course it is. But it as often arises from the quality, as from the quantity, of blood. When from excess of blood it removes the local and general symptoms of oppression, fulness, tightness, pain, and the functional derangements it has produced. Headache and flushing are relieved by a bleeding from the nose; pain and oppression of the chest by a bleeding from the lungs; abdominal pains and pulsation by intestinal hæmorrhage, or bleeding piles.

P.—What disturbances does hæmorrhage produce in the parts whereon it is effused?

Dr.—In the brain, by pressing on its substance and interrupting its circulation, it may cause *coma* or *paralysis;* or it may rupture the cerebral substance, and produce death by syncope and asphyxia combined. In the lungs, hæmorrhage may suffocate by its quantity, or cause dyspnœa and cough till expectorated, destroying or degenerating the pulmonary textures. In the glands it may mix with their secretions, as in hæmaturia (bloody urine). In passive or asthenic hæmorrhage, from asthenic plethora (that is, congestion), if the loss is profuse, exhaustion and anæmia result; if moderate, relief follows. Hæmorrhage from altered qualities of the blood is generally of the asthenic or passive kind, although the *molimen hæmorrhagicum*, that is, the excitement or determination of blood is *active pro tempore.*

CONVERSATION SEVENTY-FIFTH.

Drains and dropsies—Drains from the kidneys, bowels, and skin—Local congestion and posture as a cause—Results of the water-cure—Forlorn cases—Causes of dropsy—Blood diseases and foulness—Their cause and results.

DOCTOR.—TO-DAY we discuss the interesting subject of DRAINS and DROPSIES, that is, effusions of the watery parts of the blood, with more or less of its animal and saline matters in solution. When this result takes place in secreting organs or on open surfaces it constitutes what I shall take the liberty to call DRAINS, fluxes; thus we have catarrhal flow or drain from the nose, coryza; from the air-tubes bronchorrhœa, from the uterus and urinary passages, leucorrhœa and blennorrhœa; when in the closed cavities, as in the peritoneal and plural sacs (the investing membranes of the bowels and lungs), or in areolar tissue, it constitutes DROPSIES. Thus we have pleuritic effusion, or "water in the chest;" ascitis, effusion into the cavity containing the bowels; effusion into the ventricles of the brain, or "water in the head."

PATIENT.—Fluxes and dropsies, therefore, have much in common, that is, they arise from similar conditions of the vascular system?

DR.—Yes. They occur when the blood-vessels are unduly distended. They are the termination of local or general plethora, and may be considered as an effort of nature to relieve the blood-vessels of their distension.

P.—But in such cases of repleted vessels is it not nature's commonest method of clearing a free course for herself, by establishing what you very properly call a *drain* from the kidneys, intestines, or skin?

DR.—Yes; this is certainly a much more frequent mode of relief than by a dropsical effusion into the abdomen, chest, or cellular tissue. The former are the characteristic terminations of local or general vascular turgescence in young or robust (sthenic) subjects; the latter, belong to the decline of life, or to the break-up of the constitution (asthenic), that is, when the blood is impaired in its qualities, and usually distended with an undue proportion of watery contents. And they only occur when the kidneys and skin, the appointed emunctories of superfluous fluids, have failed in their functions.

P.—So that—as far as I can infer from your statements—these effusions, whether in the shape of *drains* or *dropsies*, are a means of maintaining the equilibrium of the circulation in all parts of the body; that the two methods in question are nature's modes of striking the balance, when she is put to her shifts, and that of the two, the latter, or effusion into cavities, is nature's last and worst alternative?

Dr.—Well; I cannot say but what you have put the case very fairly, and represented as exactly as possible the relative offices and pretensions of these two modes of self-rectification in the system. But the disturbed balance of the circulation is not all. Flowing from that we have embarrassed secretion, retained superfluities in the blood, as is instanced in the sudden suppression of a cutaneous eruption, or an ulcerous discharge. Here the safety-valve operations we are discussing come equally into play. We have the balance of the circulation restored, or an outlet opened for superfluities in the blood, by the occurrence of diarrhœa, anasarca, a bronchial or leucorrhœal discharge.

P.—I should presume that the congestion caused by checked perspiration, or external cold, relieves itself by some of these vents?

Dr.—You are quite right. The equilibrium of the circulation is restored by some catarrhal discharge from the bronchi, or other leading passages. Even the colliquative sweats of advanced phthisis (consumption) are to be regarded as drains of this nature; in other words, are pent up excretions finding vent; obstructed blood-vessels relieving themselves, by revulsion and transfer of irritation.

P.—Generalising your statements, then, am I to understand your doctrine to be, that local congestion is the most common cause of partial dropsies?

Dr.—Yes; venous obstruction is the grand producer of dropsy. Thus we have œdema (puffy swelling) of the face and upper extremities, from pressure on the descending cava or vena innominata; we have the same condition of the legs from pressure on the iliac veins; we have dropsy of the belly (ascitis), and of the superficial tissues generally (anasarca), from obstruction of the ascending cava, or of the portal system. In the same way, we have chronic hydrocephalus, from partial obliteration of the venous sinuses of the brain.

P.—What most commonly determines the various obstructions to which you refer?

Dr.—Visceral disease, unquestionably. Thus we have CIRRHOSIS (contractile disease of the liver) producing *ascitis;* structural diseases of the heart causing hydrothorax (water on chest); chronic bronchorrhœa (humid asthma), and often general dropsy. Whatever impairs the respiratory action induces pulmonary congestion, as tubercular deposit, solidification of lung, asthma, emphysema, distension and rupture of the air-cells, laryngitis (or inflammation of the windpipe), coma, asphyxia, &c.; the stagnation of the pulmonary vessels so induced eventually ends in bronchorrhœa or hydrothorax, unless relieved by some other way—by an abnormal action, for example, of the skin or other outlets.

P.—You talked of an atony of the vessels the result of sheer weakness of circulation, and named it *gravitative congestion* (hypostatic)—may not dropsies and drains often arise simply from this cause?

Dr.—Very likely. We have thus œdema of the lower extremities and leucorrhœa, from continual standing, in atonic subjects. Colliquative diarrhœa (that occurring in patients reduced by hectic, as in consumption), and the swelling of the legs indicative of the approaching termination of chronic diseases, is no doubt, in most cases, a result of this nature. We have many other instances of serous effusions, mucous *drains*, the result of an atonic state of vessels following on inflammatory excitement. Thus after erysipelas, we have œdema of the part. Leucorrhœa, blennorrhœa, bronchorrhœa, are results of this congestive condition of vessels.

P.—May not determination of blood produce drains and dropsies?

Dr.—Yes. Cold, by driving the blood inwardly, and thereby stimulating the secretory organs and surfaces, will produce diarrhœa, catarrh, and diuresis. The irritant action of snuff, by causing a rush of blood to the nostrils and eyes, determines a flow of nasal mucus and tears.

P.—This explanation lets me now understand how aromatics, saccharine, saline, or savoury substances of any sort operate a free discharge of saliva into the mouth.

Dr.—Another illustration. In the same way irritant vapours, as the fumes of vitriol, produce a mucous flow from the air-tubes.

P.—Purgatives a flow from the intestines?

Dr.—Precisely. In all these the secreted fluids differ from the products of inflammation. There is an excess of saline matters which makes them acrid and corrosive in various degrees. We have also an instance of determination of blood without special

irritation, producing a mucous flow, in the leucorrhœa, preceding and following the catamenial period. The dropsy accompanying tubercles of the peritoneum, or membranes of the brain, arises from the irritation they produce in the part, and the consequent flow of blood. Inflammatory dropsy results from an altered condition of the blood, &c.

P.—May mucous overflow and serous overflow—that is, your drains and dropsy, succeed or displace each other?

Dr.—Yes. Hydrothorax may be removed, to a certain extent, by bronchorrhœa. Diarrhœa may clear away ascites or hydrocele; or ascitis supervene on checked diarrhœa. Diuresis, or copious action of the kidneys, often removes dropsy.

P.—Does not this suggest the effective treatment of dropsy?

Dr.—Your question is very pertinent. We *do* find, in effect, that the activity of the kidneys and skin, which we can command by the water processes and their adjuncts, serves as a powerful drain of dropsical effusions—a drain, in fact, they cannot withstand. But once open freely this great outlet of superfluous fluids, and the cure of dropsy is speedy and certain, when there is no organic disease, incurable or about to end fatally.

P.—I suppose your system must be the safest, according to your showing of the matter; for your diuretics and sudorifics introduce no foreign substances, no gratuitous irritants to fret the delicate vascular linings, or to obstruct and paralyse its safety valves, already all but giving up the contest for life. What can be hoped from digitalis, calomel, elaterium, Dover's and James's powders, &c.?

Dr.—True. You fully comprehend the *rationale* of our system, and quite appreciate its relative advantages. But, as I have told you before, I refuse no rational adjuncts—diuretics, purgatives, &c., when needed—to the powerful processes of the water-cure. Every little helps. I have a case in point just now, in No. 53, a gentleman who is in his seventy-seventh year. About six weeks ago his legs were enormous with dropsy. It extended up the back to the shoulder blades, and invaded the cavity of the pleura, pressing on the lungs, and causing great difficulty of breathing. In less than a fortnight, as Dr. Horner, who saw him daily will tell you, there was no trace of dropsy left, and he could walk across the room with assistance. On the night of his arrival here, accompanied by friends from his estate, we found the pulse 160, and it persisted for several days. He had been two years ill, the pulse intermitting, and other signs of heart disease. Few would have hoped to see him up again.

P.—Bless me! You seem to have some desperate bad cases come to test your skill and water cure?

Dr.—True; they sometimes seem to drop from the moon. I have them, *often without notice*, from all parts of the world. For instance, one evening, on my return home, I found a gentleman just put to bed. On asking who he was, and where he came from, he replied, "I have come by the urgent advice of one of your patients, above 1,000 miles to see you, and have all but died by the way. My physician told me yesterday, as I passed through London, that I should never be able to reach Malvern; but here I am, and on the table you will find a codicil to my will, and *directions for my funeral;* perhaps they will be needed." "Well," said I, "you expect me to return thanks, I suppose, for the preference you have given me? They will be glad to say I killed you." But he made a rapid recovery to the astonishment of many of my patients who saw him.*

P.—I must say I am surprised when I consider these matters, when I know that at one time you had not had a death for four and a half years in your practice. There must be something more than good fortune, something *preservative*, in the power of water-curing, good nursing, and management. *Viva l'aqua!* To resume my inquiries, what determines at one time a *drain*, at another *dropsy*, from excess of blood gorging a structure?

Dr.—Certain conditions of the vessels and of the blood. Extreme vascular distension will result in either rupture and hæmorrhage, or a sanguineous secretion, or in an exudation of the watery parts of the blood. Long continuance of congestion or plethora makes exhalation predominate over absorption. A poor watery state of the blood, and an atonic state of the contractile fibre (relaxed solids), either separately or combined, conduce to these results. The persons so predisposed, are those of pale complexion and phlegmatic temperament.

P.—I suppose it is a law, that wherever the blood is diseased, there exist the relaxed solids you speak of?

Dr.—Yes, we have necessarily toneless muscles and toneless vessels from the vitiation of nutrition which must inevitably result from impaired or diseased blood. The joint operation of both classes of causes is illustrated in the liability to dropsies and drains

* He fell from one fainting fit into another the whole of that night. I believe I kept him alive with *hot fomentations* to the heart and stomach, assisted with *French brandy*, to live on for a water cure.

occurring after long fevers, from deficient nourishment, or confinement in impure air.

P.—The poor condition of the blood, then, it seems, tends most to watery effusion?

Dr.—Yes; their fluids, as before shown, are prone to transude through the walls of the vessels. In the anæmic, in those depleted, the bulk of the lost blood is replaced by the watery serum absorbed from the various textures. This diluted sanguineous current does not afford adequate stimulation to the heart and vessels. A grand condition of vigorous circulation is a certain degree of spissitude, and a certain volume of blood in the vessels. The blood should be of an unctuous fluidity. When these conditions fail, when the blood is too thin and watery, the circulation gets embarrassed. The moving apparatus of the heart and vessels flags in its propulsion. This lagging circulation, this congested state of the blood, allows the effusion of its watery particles.

P.—What other causes of thin blood are there in relation to dropsy?

Dr.—Imperfect excretion by the liver, kidneys, and skin, are the sufficient cause, when no depletions have taken place to account for an anæmic state of the circulation.

P.—What are, in fact, the grand conditions of dropsy?

Dr.—*En bref*, failure of some of the excreting organs, at a time when vascular turgescence, in some of its forms (as plethora, intense irritation, congestion, or determination) exists.

P.—Is not exposure to cold often a cause of dropsy?

Dr.—It is; on the same principle, viz., checked perspiration, by deranging the circulation, disposes to congestions and inflammation. This ordinarily will produce a drain from some of the mucous passages, being nature's expedient for unloading the vascular turgescence, and eliminating a surplusage of matters which some locked-up excretory has failed to discharge. If, under these circumstances, the action of the kidneys evidently fails, then dropsy will result. Acute dropsy from exposure to cold is always associated with albuminous urine, a proof that the kidneys have failed.

P.—Can you account for the kidneys so "knocking up?"

Dr.—Yes, most clearly. And here I have to explain one of the grand rewards of *temperance*, and one of the bitter pains and penalties of *intemperance*. Those in whom the kidneys so knock up, on exposure to cold, are almost invariably, with one exception, those who habitually dose themselves with alcoholic potations in

greater or lesser measure. The kidneys exhausted by the excitement of these stimulant drinks, become easily congested, when cold determines the blood to the interior viscera. Hence, their gorged vessels are not in a state to do their own work, let alone to discharge the vicarious duty the disturbed balance of the circulation now imposes upon them. They mechanically exude serum instead of eliminating the proper constituents of the urine.

P.—I suppose, then, it is these noxious elements, with the superfluous water accumulated in the blood, that, escaping here and there into cells or cavities, or by mucous membranes, cause dropsies and drains (perhaps hæmorrhages), as you have described all these? The *rationale* of this, I perceive, is as clear as daylight.

Dr.—You correctly infer. The pent up materials of the blood are thus thrown off, *pro tempore*, wherever an exit can be afforded them, and thus relieve the individual from far graver risks. In fact, their extrication in any shape, by any vent, is a *sine quâ non* of existence. With these retained in the circulating current, the vital machine could hardly be kept working, and that for a few days only. But so it is, the abuses of the belly chiefly, the gormandising and drinking propensities of mankind crowd the vascular system with a load of materials, that sooner or later obstruct the capillary passages, the seats of the more vital operations, solidify and degenerate the glandular structures, and harden and dry up all the finer textures, whose softness and lubricity is the characteristic of the *youth* of the machine, and which the longer it is retained, the longer *old age* is postponed. In this way the majority of men die before half of their days are run out, with every visible mark of old age. In fact, they die by the *clogging, obstruction, and failure of the safety-valves*, while the capabilities of the rest of the machine are as great as ever they were, if only the proper conditions of their working were attended to. There are few bipeds, who can be persuaded, how much more they eat than nature requires, and how great is the penalty that follows.

P.—Dropsy after scarlet fever, is, I believe, a very common occurrence—how do you explain this?

Dr.—Here the urine is always albuminous, and the disease is clearly referrible to morbid action of the kidney. The kidneys are congested and their secreting power is lowered. In the same way the liver is congested in bilious and intermittent fevers, and its secretion suspended; added to this, the blood has sustained a

ferment; and the two great sentient surfaces, the skin and mucous membranes are in a high state of irritation.

P.—This, I suppose, is the exception you referred to, when stating that the abuse of alcoholic liquors generally lay at the foundation of diseased kidneys and the dropsy connected therewith?

Dr.—You have rightly conjectured. The subjects of scarlatina are not usually tipplers. I was going to remark, that dropsy is the most frequent termination of organic diseases of the heart or great vessels. In these cases, the functions of the kidneys and liver also give way, for they are associated with *albuminuria* and slight *jaundice*. These, in fact, are the fatal complications. *If these great excernent organs can be kept free and sound, or if they can be restored, even a diseased heart, or ossified vessels will not kill* for a long time. So true is my position just laid down, and this is but another illustration of it, that people die prematurely by the knocking up of the eliminating organs, by the clogged and disabled safety-valves.

P.—If organic diseases only kill, when things come to this sad pass, you offer then, by implication, great hope to thousands of now hopeless sufferers. The water-cure, with judicious modifications, you affirm, is the remedy *par excellence* for correcting the faulty function of the eliminating organs?

Dr.—The records of a multitude of declared incurable cases attest the extraordinary power of the water processes in disengorging loaded glandular structures, the prime of them, the kidneys and liver, absorbing their morbid deposits, provided these have not become too hard through age, so as to amount to an impervious unyielding foreign substance, as we see in cirrhosis of the liver. All else yields marvellously. In Indian livers, and kidneys deemed incurable, I have seen wonders done, where the skin was made the chief outlet of the superfluous fluids of the body, and the congestion of the organ was sufficiently relieved by the powerful revulsion to the surface, implied in our operations on the skin. So that there is truly great hope for the otherwise hopeless. In many cases, those suffering under formidable structural degenerations, every day, every instant, threatening the extinction of life, may have the fatal result postponed, and the endurance, if not enjoyment of their existence considerably increased. What I have just said, as you know, may be verified by any medical practitioner who takes sufficient interest in *science* or *humanity* to visit any

water-cure establishment, conducted by a qualified practitioner. I now reckon nearly a hundred *medical men*, who have been here, most of them invalids, *retired* from the profession, or belonging to the army or navy. I sincerely believe, that not *one* of them has departed without being impressed with the vast benefits to be derived from a judicious application of the water-cure treatment.

P.—I know what you state to be the fact. By-and-bye you will see there will be a *rush of too many* explorers into your health-manufactories. To return, I have often heard the term inflammatory dropsy. I want to know all about it. Pray explain me this also.

Dr.—It is generally that which occurs suddenly, as from cold or scarlatina. Marked febrile symptoms are present, as frequent, hard, sharp pulse; hot skin; thirst; buffy blood. These symptoms mostly coincide with anasarca. It is often attended with all the symptoms of rheumatic inflammation, as heat, tenderness, redness, and swelling of the joints.

P.—There seems, then, some essential connexion between gout and rheumatism, inflammatory excitement of the system, and states of defective urinary secretion?

Dr.—No doubt there is. Rheumatism is a frequent complication of albuminuria. Granular kidney supervenes on the most aggravated forms of rheumatism. It seems to me, clear enough, that the obstructed function of the kidneys, by leaving in the blood certain irritant excrementitious matters, explains much of the morbid phenomena you refer to. In fact, under such circumstances, we *do* find *urea* in the blood, and in various effusions. I hold that this is the irritant morbid matter *par excellence*. The constitutional excitement characteristic of fevers is, in a great measure, owing to the effort of the system to relieve itself of these retained matters, the sundry effusions and discharges the body sets up, being the best vents of elimination that remain to it in nature's exigency.

P.—*Blood diseases* and *blood foulness*, then, are no fictions?

Dr.—Rheumatism is one of them—lithic and lactic acids are the chief ingredients of its morbid excitants. Its symptoms show the efforts of the system to eliminate a poison from the circulating current. There is an excess of urea in the urine of patients recovering from rheumatism. The chief popular remedies for *gout* and *rheumatism*, as *colchicum*, &c., are those that increase the elimination of urea, and throw it down in the urine.

P.—Yes. I think you made that very plain before, that the

chief foundation of gout and rheumatism was an excessive production of urea, however produced, or what is equivalent to that, an insufficient elimination.

Dr.—But the retention of excrementitious matter in the blood is not all in defective urinary secretion. There is a drain of albumen from the blood. This, by thinning, impoverishing the blood, predisposes to dropsies and drains; and protracted cases end by these very results. In advanced cases of granular kidney, every congestion or determination of blood ends in a watery effusion, and this the more readily the more anæmic the subject. As the powers of the circulation fail, the effusion occurs chiefly in the lower extremities, simple gravitative congestion. This form of dropsy may be called the *passive* or chronic, in contradistinction to what I pointed out as its *acute* and active form. It is characterised by impoverished blood, depressed circulation, low organic, and a cachetic state of the whole system.

P.—What, then, is the great distinctions you would establish between the acute and chronic forms of dropsy?

Dr.—The *acute* dropsy may be called the *sthenic* form. It arises from the retention in the blood of the excrementitious matters and the water which the kidneys fail to eliminate. The *chronic* dropsy is the *asthenic* form. Although often originating in the same way, it is chiefly dependent upon watery or impoverished blood—blood especially deficient in albumen.

P.—Therefore, I should say, that an excess of watery matters in the blood, or the thin blood of the less robust sort of vegetarians, is akin to disease?

Dr.—Your remark is not without foundation. But we need scarcely open this ground again, having discussed these matters in our dietetic conversations.

P.—How does the deficient blood in question usually arise?

Dr.—First, from the existence of irritation in an important organ, and from the continued drain of serum by the urinary outlet; and second, from the defective assimilation and nutrition connected with this state.

P.—May not this defective state of blood, without disease of the kidneys, induce dropsy?

Dr.—Yes; the chronic and asthenic forms of dropsy. Wherever the albumen of the blood is below the natural standard, as in anæmic sheep with diseased liver, dropsy is induced. So in man it is brought on by scanty or poor food, by close confinement in

unhealthy places, or malarious districts. The dropsy that supervenes on extreme states of debility, or cachexia, is dependent not merely on weak or obstructed circulation, but on impoverished blood, which predisposes to these irregularities of circulation. In like manner, organic diseases of the heart and liver, which cause congestions, do not induce dropsy till the quality of the blood is impaired, either by imperfect excretion, or insufficient nutrition.

P.—I have taxed you too long to-day; but, in conclusion, sum me up the differences between *drains* and dropsies.

Dr.—Dropsy is associated with an altered condition of the blood. A drain is a mucous discharge, rather the result of simple congestion and determination of blood, than of impoverished fluids. A drain is a more partial disease—many things tending to relax the vessels of a part without impairing the blood of the system. Secreting organs and surfaces are its common seats. Drains are not so much an excess of the natural secretion, as the superaddition of watery, saline, and albuminous matters derived from the blood. The fluids of the chronic discharges from the nasal passages, the air-tubes, the stomach, and intestines, and the genital mucous membranes, are the natural mucus of those respective surfaces, diluted with the serous and saline matters, &c., which confer on the discharges their acridity. This serous fluid is often substituted for the proper secretion, as we see in the coagulable urine of the more advanced stages of granular kidney. Protracted drains are very apt to become habitual, through permanent relaxation of the affected vessels. These are often so weak that anything vexing the nervous system, or disordering the circulation will bring on an attack.

CONVERSATION SEVENTY-SIXTH.

Inflammation—*Definition, symptoms, causes, results, remedies.*

Patient.—I am anxious to hear you explain to-day the doctrines regarding *inflammation*. I believe, I have heard you say,

that in your long professional life you have met with but few, who had more than a vague notion of its essential nature?

Doctor.—True; I am sorry to say it is so. It is to Macartney's profound researches on inflammation, of which he gave us the benefit in his admirable teaching, that I owe my first and continued interest in what may be called the morbid condition *par excellence*. It is a subject truly of the highest importance to understand correctly, from its frequent occurrence, its complex nature, and the large part it plays in morbid phenomena generally. In fact, it embraces all the elements of disease previously discussed, with still wide deviations from the structural and functional standards of health.

P.—How do you define inflammation? That is the first thing I should like to hear.

Dr.—It is a local excess of blood, with the motion of the blood partly *increased*, partly *diminished*. You see this illustrated in the strong pulsation of the arteries leading to an inflamed part, as a boil, or festering wound, and of the partial stagnation of the blood in the inflamed locality.

P.—Is this exaggerated action of the larger vessels for the purpose of clearing the obstruction of the smaller?

Dr.—It may be so.

P.—But have I not heard somewhere that the nature of inflammation has been much mystified by pathologists?

Dr.—It has, I confess, too much engrossed the attention of some pathologists, to the exclusion of other elements of disease. Its *component* parts, besides, have been too much overlooked; it has not been well analysed. Its nature will be best understood by referring to the ultimate and proximate elements of disease already discussed.

P.—What are the most general outward signs or distinctive characters of inflammation?

Dr.—Redness, heat, pain, and swelling. Hence the terms, *inflammation*, *phlegmasia*, *phlogosis*, as expressive of burning, &c.

P.—Are not these symptoms also sometimes produced by congestion and determination of blood?

Dr.—Yes; but they are less marked and less persistent.

P.—What is the *rationale* of these characteristics of inflammation?

Dr.—The *redness* is not merely from the excess of blood in the

part, but from the excess of red particles in the inflamed vessels, the source of its peculiar results. The *heat* is owing to the increased chemical changes taking place in the blood, as well as its more rapid motion. The *pain* is referrible to the distension of the parts, and the consequent pressure on the delicate nervous fibrils. The *swelling* arises from the gorged state of the vessels, and the effusions poured out among the interjacent tissues. The quantity and quality of these effusions widely distinguishes inflammation from congestion and determination of blood.

P.—What are the causes of inflammation, and how do they operate?

Dr.—The predisposing causes are whatever impairs the tone or disturbs the balance of the vascular system; while the muscular irritability and quantity of blood are not proportionably reduced. Those also are prone to inflammation whose circulation has been rendered weak or irregular by previous disease, fatigue, want of exercise, impure air, improper nourishment, &c.

The exciting causes of inflammation are divisible into the local or direct, and the general or indirect. The local causes comprehend all *mechanical*, *chemical*, and *vital* sources of irritation.

P.—Illustrate this threefold division of your local causes? What are *mechanical*, *chemical*, and *vital* irritants?

Dr.—The *mechanical* are wounds, bruises, foreign bodies in contact with sensitive parts, as a foreign body or worm in the intestines, a pea or a coin in the larynx (Brunel), a lodged bullet, &c. The *chemical* are heat, corrosive acids, alkalies, salts, and metals, medicinal poisons. These decompose the living structures the same as if they were dead. The *vital* irritants are exemplified in the action of Spanish flies, mustard, cayenne, the venom of plants and of animals, the virus of small-pox, and other noxious matters generated in the living or dead body, and applied to an abraded surface; of this class are the natural excretions, as the urine, fæces, bile, &c., when effused on serous membranes.

P.—I suppose the phenomena of gout and rheumatism, dropsy, granular kidney, &c., according to your showing, are illustrations of the same, that is, their phenomena are instances of irritation and inflammation, caused by excrementitious matters retained, or absorbed into the blood, where the functions of the excernent organs are impaired?

Dr.—You are quite right. In the same way we have local in-

flammations excited by certain poisons received into the system; for example, arsenic applied to a wound inflames the stomach and intestines, mercury the gums, &c. The virus of small-pox, scarlatina, and measles, inflame the throat, skin, and air passages—that of syphilis, inflames the periosteum, throat, skin, iris. In skin diseases, again, you have another illustration of how certain localities are inflamed in consequence of a morbid material, a specific irritant matter, conveyed thither in the blood. We find large proportions of the surface, and what is remarkable, symmetrical parts of the body, so affected simultaneously. This is observed in the eruptions of the exanthemata, and other skin diseases, in rheumatism, in syphilitic nodes, &c.

P.—What is your second category of exciting causes of inflammation, the *general* or *indirect* which you mentioned?

Dr.—They are yet more frequently productive of inflammation than the other: they are such as first produce congestion. The subsequent reaction merges into inflammation. Cold applied locally or generally produces congestion, which may pass into inflammation. Malaria and fibrile miasms produce congestion, and then inflammation. Febrile reaction is the result of these, and rises or falls, comes or goes, with the increase or subsidence of the local inflammations.

P.—I am now beginning to perceive the value of pulling disease to pieces; will you now give me some illustrations of inflammation arising out of the congestion caused by venous obstruction?

Dr.—Some diseases of the heart impeding the circulation tend to the production of pneumonia, with hepatization, and often suppuration of the lung. So adynamic fevers, and the sinking before death, are alleged to produce pneumonia. But I am disposed to think the crepitus has caused an error to creep into medical notions. I believe with Dr. Yellowly, that much of what is alleged to be inflammation in exhausted states of the system is simple congestion. There are more clear cases, however. For example, congestion of the lungs, brain, mucous membrane, &c., caused by asphyxiating agents, often end in intense morbid irritation and inflammation, which is *ultimately* the real source of danger in the accidents referred to.

P.—Whatever deranges the balance of the circulation, you say, tends to produce inflammation. I have heard that the suppression

of natural or important habitual discharges has that effect in a remarkable manner.

Dr.—The effect of a certain shock to the nervous system, and also deranging the circulation, I suppose you mean? It is so. For example, the sudden drying up of large ulcers, on the repulsion of cutaneous eruptions, or the forced arrest of the catamenia especially, in that way, may lead to and cause inflammation.

P.—It seems to me clear, from what you have expounded of the elements of disease, that many of these causes of inflammation have a twofold mode of operation,—first to produce a local fulness, and then to produce general irritation by the disturbed equilibrium, and the morbid matters so retained in the circulation.

Dr.—There is no doubt of it. And this general irritation attempts to relieve itself by establishing a new local irritation, that is, by attempting to deposit here or there a morbid action or revulsion. Thus the visceral irritation ensuing on the sudden healing of an old ulcer (or suppurating wound) may be regarded as an effort of nature to counteract the local congestion so produced, and to excrete by the bowels morbid matters in the circulating blood, previously drained away by the purulent discharge. This is proved by the microscope. The same remark holds of the inflammation of the skin, throat, and mucous membranes, in scarlatina, measles, small-pox, the follicular enteritis of typhus, and the visceral complications of erysipelas, and other specific febrile affections.

P.—The follicular enteritis of typhus? Explain that. I have been told that an ulceration of certain intestinal glands is one of the distinctive characters of typhus, perhaps the source of its gravest phenomena, or most serious complications.

Dr.—You are rightly informed. I shall explain this matter more fully another time. In the meantime let me remark that the intestinal glands you refer to (the glandulæ solitariæ et agminatæ) are no doubt excreting organs for ridding the system of certain poisonous and *putrid* matters, which it would have been exceedingly offensive to the animal to discharge by the skin or the lungs. This provision illustrates what I have so often been called on to illustrate and admire in the course of these medical conversations, the wisdom and goodness of the Creator, in the infinite precautions and expedients in apparently little matters, involving the comfort and well-being of his creatures. The same glands are diseased in endemic cholera, sporadic diarrhœa and dysentery, no doubt from

being made a fixed and vicarious outlet. In typhus they are inflamed and ulcerated, in some measure through the pure corrosive action of the poison and morbid matter they are eliminating.

P.—That is, the morbid secretions? Hence, I presume, the *intense fœtor* of the evacuations in these cases.

Dr.—You judge quite rightly. I was going to remark that this is the most probably theory of the intestinal complications in fevers and other diseases induced by an accumulation of morbid and poisonous matters in the system. The same explain the *fœtid* colliquative diarrhœa that winds up exhausting chronic diseases. And I have no doubt that the favourable influence of moderate diarrhœa in fever arises from its facilitating the evacuation of these matters, and relieving the striving nervous system, and the inflamed mucous membrane. In all these cases, I remark this coincidence, of a tendency to internal congestion, with the operation of a morbid poison irritating certain localities.

P.—These to me seem very conclusive in favour of the just but limited views you take of the humoral pathology.

Dr.—I believe they are so. Here is another fact, pointing the same way — *sthenic* hæmorrhages and drains, if too suddenly checked, without adequate reduction of the circulation, are apt to pass into inflammation. So also the causes of determination of blood, if increased in degree or in duration, excite inflammation.

P.—How do the causes of inflammation operate?

Dr.—Some, as irritants, operate first on the nerves, but the nerves are not essentially the seat of the first part of the process of inflammation. In those of the former category, there is first nervous irritation, inflammation follows, as we see in the pain of a prick, or stab, or sting, or scald, or burn. On the same principle, paralysed limbs have inflammation easily excited in them. A fact that strongly shows how injury to a nerve is followed by inflammation in parts connected with it, is this, that a case of ligature of the bronchial plexus of nerves was followed by inflammation and suppuration of the opposite hemispheres of the brain (Lallemand); on the other hand, there are causes provoking internal inflammations, which induce no known primary effect analogous to that of irritation. For example, inflammation excited by cold is preceded by no marked nervous disturbance. Inflammations often originate in congestion and sudden suppression of hæmorrhages and other discharges, without the occurrence of symptoms referrible to the nerves. Inflammations thus arising are latent, and may escape detection.

P.—Are nervous people susceptible of inflammations?

Dr.—No, not as much so as you might imagine. We have all varieties and degrees of nervous excitement without inflammation. Excessive pain and other nervous symptoms do not necessarily produce inflammation; witness severe tic, the monster pain as I have seen it.

P.—Do you mean to say that the pain of mechanical and chemical injuries, as cuts, lacerations, crushes, burns, &c., are not always followed by inflammation?

Dr.—Certainly not. Inflammation oft follows in these cases, but is not a necessary result. Proper emollient applications, as fomentations and the "water-dressing," for example, arrest the morbid tendency, as John Hunter would say, by removing the sense of injury; as Macartney would say, by applying the most soothing application to the sentient surface.

P.—That is, I suppose, something of the wet sheet process on a small scale? Do I understand, then, your doctrine in regard to the causation of inflammation to be, that where irritants excite inflammation, then the exciting cause primarily acts on the nerves; but that a nervous impression or irritation is not an essential part of the first process of inflammation, because, on the one hand, inflammation is often excited without any obvious affection of the nerves, and, on the other, it is not excited often when nervous irritation is intense?

Dr.—Precisely so. But the nerves are concerned in many of the *ulterior* phenomena of inflammation, and in its *extension*.

P.—The blood-vessels I infer, then, are the essential seat of the whole process of inflammation?

Dr.—You infer correctly. Hence the chief predisposing causes of inflammation are circumstances affecting the vascular system.

P.—How do the exciting causes of inflammation operate?

Dr.—They operate on the blood-vessels in one of two ways; first, by producing a determination of blood, that is, all irritants act in this way; or, secondly, by producing congestion, as cold, or other agents which produce congestion. It may be laid down as a *law that determination of blood when inordinate passes into inflammation*. Local congestions also are liable to merge into inflammation.

CONVERSATION SEVENTY-SEVENTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Inflammation and congestion, their difference—Allison, Lawrence, Marshall Hall, their observations—Error of Cullen—Doctrine of attraction and repulsion of fluids untenable—Effects of irritants on the frog's web, under the microscope.

Doctor.—We shall resume to-day our discussion of the nature of inflammation.

Patient.—I am extremely anxious to hear you explain the phenomena that inflammation developes in the blood-vessels. This is a highly interesting matter, which I wish to understand. If there was no such thing as inflammation, I suppose we should want but few doctors?

Dr.—In the first place, the blood-vessels are *enlarged* in an inflamed part. This is obvious from the increased redness and turgescence evident to the naked eye.

P.—But in congestion also the vessels are enlarged. In what then does inflammation differ from congestion?

Dr.—First, in the associated symptoms, that is, the greater *pain* and *heat* in the inflamed part; secondly, in its products, that is, the earlier and more abundant effusion from the inflamed vessel; thirdly, in the observed condition of the vessels of the part, that is, in the intenser red of the vessels, and the augmented motion of the blood, evident in the strong pulsations of the artery *leading* to it, in the increased current of blood from veins.

P.—But I interrupted you as you were going to explain the phenomena of inflammation. In the *first* place, the vessels of an inflamed part are *enlarged*—what follows?

Dr.—*There is*, in the *second* place, *determination of blood to inflamed parts, and enlargement of their arteries.* This was made out by Dr. Allison. Now this enlargement is traced to diminished tonicity in the affected arteries. This diminution of tonicity is the grand mobile in determinations of blood.

In the *third* place the motion of the blood is *increased* through an inflamed part—a point proved by Lawrence.

Fourthly, there is more or less *obstruction* to the passage of the blood in the vessels most inflamed. The observations of Thom-

son, Hastings, Kaltenbrunner, and M. Hall confirm this. In the web of the frog's foot, inflamed by irritants, the blood moves more slowly in the part most irritated, it gradually accumulates in the vessels, and renders them larger, redder, and more tortuous, till its motion ceases altogether, *whilst the blood courses its way with increased activity through the neighbouring channels.*

P.—Oh, the conclusion of your sentence has solved my puzzle, for I was wondering how to reconcile your third and fourth propositions on the point, viz., increased motion of the blood, with increased obstruction. But your statement, I perceive, involves no contradiction. "The witnesses are agreed."

Dr.—Yes, and I was going to add, as the *fifth* characteristic point of inflammation, *that the motion of the blood is arrested or retarded in some of the vessels.*

P.—What is the cause of the obstructed or retarded flow of blood through an inflamed part?

Dr.—There have been various hypotheses framed to account for it. Cullen held it was *spasm* of the extreme vessels. But this is opposed to observation. The microscope shows that there is dilatation, not spasm, of the extreme vessels. Hunter attributed it to an active dilatation of the inflamed vessels. But this theory is gratuitous. There is no direct vital expansile power in the vessels in this morbid condition. The tonicity of vessels is simply their normal elasticity, in consequence of which they yield to the distension of their contents, and come back again as the pressure lessens, that is, as the vessels empty, or as the blood impoverishes. In the same way a bow has no vital dilating power, but it has the property of extensibility on force being applied to it; and an antagonising power to this—a power of contraction, or tendency to return to the unstretched state. This is precisely the mode of action of vessels. The doctrine of Wilson Philip was, that of weakness of the capillaries incapacitating them for transmitting blood. Although the contractions of the capillaries is no element or aid in the circulation of the blood, yet they have their tonic and atonic conditions. Their atonic or comparatively relaxed state must, on pure mechanical principles, alone be a cause of obstructed circulation through them.

P.—It seems, then, that the doctrine of vital attraction and repulsion of fluids is untenable. I mean that which makes the blood to be drawn into, or repelled from, parts, independently of all motion of the living solids.

Dr.—It is quite untenable. It will not explain the phenomena of inflammation and other pathological states, in which the blood and its vessels are mainly concerned.

P.—I remember you before made it out, in our conversations on Physiology, that the vascular system of animals—not to say that of plants—was a nicely adjusted hydraulic apparatus?

Dr.—I believe it to be unphilosophical to assume the existence of mysterious or unknown forces to explain the phenomena of vital structure, when ordinary and ascertained physical agencies, as mechanics, chemistry, electricity, magnetism, gravitation, suffice, as in the present case of the nature and effects of inflammation.

P.—You said that the study of inflammation was much aided by observing under the microscope the effects of irritants on the frog's web. Please to detail some of these observations.

Dr.—I should remark that *cold*-blooded animals fail to show some of the most remarkable effects of inflammation. A weak irritant first causes determination of blood; then congestion results, if there be an enlargement of the arteries, veins, and capillaries. By a strong irritant, as a grain of cayenne pepper, all the blood-vessels speedily become enlarged. Those most irritated are the largest and reddest; the blood they contain stagnates and coagulates: the contiguous vessels are more or less dilated, but less red; the motion of the blood is slow, often oscillatory. In the vessels beyond, the arteries are enlarged, and their current more rapid; that of the capillaries is less evident.

P.—In fine, to sum up your observations, as I apprehend them, *stagnation* of the blood in the most enlarged capillaries, with increased activity of circulation all around—in short, a combination of congestion and determination of blood, is the great characteristic of inflammation?

Dr.—You have it precisely. These, at least, are the views best accordant with established facts, and sanctioned by the discoveries of chemistry and microscopic physiology.

CONVERSATION SEVENTY-EIGHTH.

Inflammation, and the part determination and stagnation play—Changes the blood undergoes in inflamed vessels, &c.

PATIENT.—WILL you explain further, if you please, the causes of this stagnation of blood referred to in our last, as constituting one of the great elements of inflammation?

DOCTOR.—These causes exist partly in the vessels, and partly in the blood. I will first endeavour to make you understand the former.

A certain tone, elasticity, or expansile power, is necessary to maintain a due calibre and tension of vessels, in consequence of which they are placed in the fittest condition to transmit onwards the force of the arterial current, or of the heart's impulse. The vessels, if weak, atonic, flaccid, or inelastic, do not equably convey forward the current; they become distended, and absorb or spend bootlessly the force of the current; and therefore become a cause of its retardation or arrest.

P.—But how does this result in inflammation?

DR.—This will be best understood by comparing other local modifications of the circulation. In *determination of blood* the arteries are enlarged; but so are the capillaries in proportion. The circulation is therefore equally increased. In *congestion* the capillaries are enlarged, *without any increase of the arteries.* Motion, therefore, is impaired, but it is gentle and equable through the mass. But suppose you add to the congested capillaries an augmented current; or, if to determination of blood (enlarged arteries) you add atonic congestion of the capillaries.

P.—What have we then?

DR.—Why, the propulsive force of the current will be clearly impaired. The blood will pulsate or oscillate in the distended vessels, rather than pass through them. The main current will pass through the collateral anastomosing channels, which become the seat of simple determination, or increased flow of blood; this is the state of matters in incipient inflammation. If the capillaries do not speedily recover tone, or if the arteries do not speedily contract, the blood stagnates in parts; its particles adhere to each other and to the walls of the vessels, and obstruction is

thus confirmed. The arterial ends of some of the obstructed capillaries are still open, and exposed to the *vis a tergo* of the supplying arteries. The undulations thence arising strain the coats of these vessels, and cause an oscillatory movement of the blood particles, but no passage through them.

P.—Well, I now hope I am beginning to comprehend this interesting matter. All this makes clear that one cause of stagnation of the blood in an inflamed part is a weak inelastic state of the capillary vessels.

Dr.—This best illustrates the nature of *atonic congestion*. It solves the enigma how an atonic state of the capillaries causes a diminished flow of blood through them; and how an atonic state of the arteries causes an increased flow of blood through them. It also explains how the continued application of a stimulant to a part is followed by congestion, and not by inflammation—especially in a venous organ, as the liver. The effect of a stimulant is to exhaust the contractility of the smaller vessels, leaving them weakened and distended by their contents.

P.—This certainly sounds like ingenious theorizing.

Dr.—Pardon, gentle sir. There is much more in it than mere theory. It is not only correct reasoning from experience, but it is countenanced also by direct microscopic observation.

P.—I admit this question of the effects of stimulants on the capillaries of vital organs, gives you an immense advantage in showing up the error and danger of many of our dietetic habits.

Dr.—That matter was put on its right basis for the first time, perhaps. But to keep to the point in hand, to revert to the revelations of the microscope. On the application of a strong stimulant, the previous arterial contraction is not apparent, but the enlargement is speedy and obvious, causing extreme rapidity of motion and distension in all the vessels. By-and-bye the size of the arteries begins to diminish, and with it the motion of the capillaries beyond them. Many of the capillaries still retain their enlarged dimensions: in these motion is most sluggish, and in some parts ceases altogether.

P.—So much for the changes which take place in the vessels, as causing stagnation or obstruction of blood, and other features of inflammation. Will you please now to explain the changes that take place in the blood itself in inflamed vessels?

Dr.—John Hunter, and more recently M. Gendrin, noticed the coagulation of the blood in most inflamed vessels, and adhesion of

the fibrine to their interior. Dr. M. Hall attributes the obstruction of the vessels in inflammation to adhesion of blood globules to their walls. Dr. Williams, in 1841, made special researches in the web of the frog on this point of the early stage of inflammation. These have been confirmed by several other observers. They are as follows.

First, a motionless layer of serum intervenes between the circulating current and the walls of the blood-vessels. Secondly, the blood particles, that is, the colourless or lymph globules, often get into this still layer, remain fixed there, or move more slowly along than the rest of the blood. Thirdly, these white globules, or pale corpuscles, greatly differ in number under different circumstances. They are formed in greater quantity within the vessels of an inflamed part (this has been noticed by Gendrin, Gulliver, Addison, and others). Fourthly, these white globules have a remarkable disposition to adhere to the walls of the vessels and to each other.

P.—I suppose, then, that the adhesive qualities of these globules, with their increased production is the main cause of the obstruction of inflamed vessels.

Dr.—Right. They are the chief cause.

P.—Will you give me some account of these pale corpuscles?

Dr.—They are distinctly spheroidal bodies, of a gelatinous consistence, and composed of granules, some of which have the appearance of nuclei. They are invested by a delicate membrane, coagulated albumen or deutoxide of proteine, constituting a compound granular cell, which, by the action of water, bursts (more quickly, however, by a solution of potass), and discharges granules and molecules. The granules probably have a central nucleus, or molecule of fat, which makes their specific gravity lower than that of the red particles. Hence their disposition to collect in the buffy coat of inflamed blood.

P.—I fancy there must be other elements in inflammation. For example, the determination of blood to an inflamed part must send a rush of oxygen and its carriers in the red particles into the obstructed portions. What is the effect of these new actors in the scene? what share has the oxygen and the red particles in the obstructed vessels of inflammation?

Dr.—A thoughtful question, and not irrelevant. Here is the answer. The blood liquor is highly charged with proteine, which being further oxygenated, assumes the solid form of the deutoxide. Determination of blood favours the transfer of oxygen to the proteine

contained in it. As proteine becomes oxidised, it consolidates in a granular form, and the more readily around the oily molecules, always diffused through the blood liquor. These form the nucleoli visible in the larger granules. But the granules also cohere in clusters, and form the pale corpuscles of various sizes, which appear to roll slowly along the walls of irritated vessels, or to adhere to them. This explains the sudden manner in which they appear in such numbers in the vessels of the frog's web, after squeezing, &c., which partially obstructs the vessels, and directs the force of certain currents on their contents. The walls then appear studded with adherent and creeping corpuscles. But as, in this instance, the impediment and determination are not permanent, these corpuscles soon disappear.

P.—In inflamed vessels, however, I presume, they are constant elements, and as they are the chief cause of vascular obstructions, they lie at the foundation of all the phenomena of inflammation?

Dr.—They do; that is your clue. Hold on by that, and you will thread the labyrinth and unriddle the whole matter.

P.—Do you suppose that this peculiar disposition of the pale corpuscles to adhere to the sides of the vessels a result of vital attraction?

Dr.—Certainly not. It is simply the physical property of adhesiveness common to soft glutinous solids. On the field of the microscope, the pale corpuscles at once stick to the glass, and are not free, like the red particles, to float in liquid.

P.—Now that you have explained the share the oxygen has in the obstruction of inflamed vessels, will you enlighten me as to what share the *red* particles have *per se*, I mean *not* as vehicles of oxygen?

Dr.—They are less concerned than the white corpuscles. So long as they have a clear channel through the adherent or sluggish corpuscles of the side, they show no tendency to cohere, or form rouleaux. But if their pathway be barred by the aggregation of the white corpuscles, then their flexible elastic bodies get regularly jammed in between the interstices of the white corpuscles. The contents of the vessels at once appear stagnant, and uniformly of a deep red colour—a sudden coagulum of red particles as it were—the liquor sanguinis having filtered through. This explains the redness and distension of inflamed parts. It is, in most instances, produced so suddenly, that the process cannot be watched. The successive changes escape observation.

This elucidation of a rather complex and obscure subject will aid us in understanding the further results of the inflammatory process. For you who are so good at drawing conclusions, what conclusion do you draw from the foregoing?

P.—A confirmation of the doctrine set out in your definition, viz., *that the most essential feature of inflammation consists in increased motion or determination of blood to the affected part, with more or less obstructed flow through the part—the force of the increased motion being partly expended in the arterial end of the dilated capillaries, and partly diverted into the collateral anastomosing channels.* That the vascular obstruction is attributable partly to the increased mass in the smaller vessels; partly to the diminished elasticity of their coats, partly to the unusual formation of white corpuscles, which adhere to the walls of the tubes, and to each other.

Dr.—Most apt patient and pupil! *Au revoir.*

CONVERSATION SEVENTY-NINTH.

Determination and congestion — Structural degeneration — Revelations of the microscope—Suppuration, sloughing, mortification.

Doctor.—To-day we will consider the further changes effected by inflammation. Their source lies in the combination of determination and congestion. The former is more permanent, and the latter more complete, than when occurring simply. Hence the natural functions of the vessels are much modified by inflammation, and this in different modes in different parts of the inflamed locality. Vital properties will necessarily be depressed in the channels of obstructed flow, and exalted in the channels of increased flow.

Patient.—I suppose it is the union of two such opposite conditions, that is, diminution and increase of vital actions, almost in the same spot, that renders continued inflammation so seriously destructive to structure, as well as detrimental to function.

Dr.—Yes; inflammation is a combination of very opposite phenomena,—a compound of elements apparently adverse, incom-

patible, or contradictory; of action at once increased and diminished, powers at once lowered and exalted, of absorption and secretion, opposite functions, both intensified. Inflammation also at first much exalts sensibility, causing tenderness, pain, and spasms. The obstructed circulation may cause a suspension of these properties in the centre of the evil, confining them to surrounding parts the seats of determination. The sympathies of inflamed parts are also increased. Natural secretions too are dried up or altered in qualities, according as an excess of saline, serous, or albuminous parts of the blood predominate. This involves changes of nutrition and secretion.

P.—That is, structural degeneration, as you define it?

Dr.—Precisely. This is an important early part of inflammation, which we shall discuss afterwards at greater length. I was going to remark, that the effusion from inflamed vessels is much the same as from intense congestion and determination of blood; but is more abundant, contains more animal matter, and, as inflammation advances, presents appearances not found in the products of mere congestion or determination.

P.—Now to hear what are these appearances.

Dr.—This effusion, *at first*, is a thin serum, causing swelling in complex textures, accumulating in the dependent parts of serous cavities, or diluting the more simple secretions of the mucous membranes. But soon fibrine is also effused, part of which may concrete into coagulable lymph, or still remains dissolved in the liquor sanguinis. The inflamed pleura, for example, is coated with a film of lymph, and the clear fluid effused into the sac, when removed from the body, often spontaneously separates into a fibrinous clot and serum. This occurring in complex textures, gives a hardness to their swelling, as in the phlegmon of the cellular membrane, as in a boil, and hepatization of the lungs. In mucous membranes, it causes the thickening of the submucous tissues, and their unusually viscid secretions.

P.—What are the revelations of the microscope as to the nature of inflammatory effusions?

Dr.—Very precise. Yet there is room for further research as to their varieties and their relation to each other. First, in the frog's web, after inflammation has continued some hours, white globules, or corpuscles, with specks in them, are seen to ooze from the vessels, exactly like the pale granular globules within the vessels. They are called exudation corpuscles, granule cells, or

fibrinous globules. They are quite distinct from the mere albuminous globules, or the consolidated globules of fibrine. These are found in various inflammatory effusions. Secondly, the fibrine effused by an inflamed membrane also contains a mesh of extremely fine fibres (Gulliver and Addison) with nucleated or granulated corpuscles. Thirdly, some portions of solid effusion present no distinct structure, but are either irregularly granular, like coagulated albumen, or completely amorphous and homogeneous (Vogel). These occur in various proportions, and present different modifications.

P.—Will you now please to satisfy me with a summary of the elementary solids of these inflammatory effusions?

Dr.—First, you have *primitive particles*, or molecules, infinitely minute, each appearing merely as a dark speck; Davy, Gulliver, and Gruby, suppose it to be composed of fatty matter.

Secondly, *granules* measuring from $\frac{1}{12000}$ to $\frac{1}{8000}$ of an inch, appearing as a light spot, surrounded by a dark circle, probably deutoxide of proteine, with a central molecule of fat.

Thirdly, *fibrils* extremely fine, interlacing and decussating, the same as those seen in the buffy coat of the blood.

Fourthly, *lymph* or *exudation corpuscles*, compound granules or granular cells, from $\frac{1}{6000}$ to $\frac{1}{7000}$ of an inch (Gulliver), composed of granules and molecules, and sometimes enveloped in a cell.

Fifthly, *pus globules*, enlarged modifications of the last, but more distinctly cells containing liquid, with more or fewer granules, some of which are of larger size than the rest, forming nuclei. Besides the solid deutoxide of proteine, which constitutes their solid parts, they contain the dissolved tritoxide of proteine.

Sixthly, *irregular granules and hyaline matter*. The former is albumen, with more or less fat; the latter is also albumen, with more or less gelatine. These constitute the materials of aplastic or cacoplastic deposits. They often exhibit traces of cells and fibres, but appear degenerated or imperfectly formed.

In addition to all these, inflammatory deposits or effusions usually contain the normal solids of the part, as mucous globules, epithelium scales, epidermis, and blood corpuscles.

P.—It is clear enough, therefore, from your account that these solid products of inflammation are no other than the normal materials of nutrition, those from which the structures of the body are built up?

Dr—Precisely so, and they present every variety of plasticity, or capacity of organisation from that of perfect cicatrices and false membranes, down to yellow tubercle.

P.—You make it out, then, that tubercular matter, pus, and coagulable lymph, are only varieties of the same albuminous matter that exists in the blood?

Dr.—I have no doubt of it; in fact, it requires no great effort of the understanding, it is as clearly perceived as the Malvern hills in the sunshine of day.

P.—Is inflammation always attended with these effusions?

Dr.—Always, more or less. If the inflammation is slight this effusion may remove it by unloading the engorged blood-vessels. When, on the other hand, inflammation is more intense, the obstruction more considerable, and the determination stronger, then the effusion may proceed far and not resolve the inflammation.

P.—What results then?

Dr.—This more serious effect,—the effused matter saturates and compresses the adjoining structures, deranges their nutrition, and impairs their cohesion. Hence, we have, *ramollissement* of complex textures, as the brain, which retain the effused matters. The continued obstruction on the inflamed part leaves the blood and lymph free to the absorbents. The high pressure and determination of blood promote this process. Hence, as new matters are effused, old textures are compressed, disintegrated, and absorbed —the finer exudation corpuscles and fibres themselves are absorbed or altered, and large pus globules alone remain. This is *suppuration.*

P.—What then is the process called GANGRENE or MORTIFICATION, which is allied to it I believe?

Dr.—It is. If the original obstruction of the inflamed vessels be extensive, or be rendered so by subsequent effusion, the supply of blood may be so cut off from a part that it dies.

P.—What then happens?

Dr.—One of two things. Either the dead part is dissolved and absorbed only at its surface—it then separates from the living parts in the form of a *slough.* Or, if more extensive, the dead part may pass into decomposition before it can be separated. This is *gangrene.*

P.—You mentioned before of effusions *solidifying.* What conduces to this result?

Dr.—If the inflammation be of a lower kind, the obstruction

less complete, the effusion more gradual, the nutrition of the natural texture is only impaired not arrested; and from the increased deposit of solid matter, *induration* or *consolidation* supervenes.

P.—I think I understand your answers, they appear to me quite satisfactory. Many thanks, enough for to-day—your explanations have afforded me much satisfaction, for I perceive how clear and simple things complicated may be made to appear in your way of proceeding by degrees.

CONVERSATION EIGHTIETH.

General or constitutional symptoms—Inflammatory fever—Chronic inflammation.

PATIENT.—You before explained the local symptoms of inflammation. I am anxious to hear you discuss to-day its *general* or *constitutional symptoms?*

DOCTOR.—Willingly. The *entire body* sympathises with a local irritation. *All* the functions are more or less disordered. The action of the heart and arteries is quicker and more forcible. The skin is dry and hot. The appetite and strength are impaired. The secretions are diminished and denaturalised. In short, we have inflammatory fever. Everything betokens the panic of an invasion, the nervous system is up in arms, and the heart beats the alarm-bell.

P.—What is the condition of the blood in such case?

DR.—It is entirely changed. There is an excess of fibrine and colourless globules, with an abnormal separation and contraction of this fibrine, producing the *buffy coat.* The amount of the latter is in proportion to the extent and intensity of the inflammation. The development of white globules in an inflamed part is more remarkable in inflammation of serous membranes, than in those of mucous or parenchymatous structures. In acute rheumatism the fibrine is most augmented.

P.—In low fevers, I suppose, the fibrine is diminished?

Dr.—You conjecture rightly. But the buffy coat and inflammatory excitement do not necessarily depend on each other.

P.—As regards the pathology of inflammatory fever, does it ever really precede the distinct development of local inflammation?

Dr.—A puzzling question to many. What answerest thou, O Brossais, the great and lamented! The plain common sense scientific view of the matter is this. Inflammatory fever is the symptomatic fever of inflammation; in other words, it is the general excitement or reaction after the disturbing influence of the exciting cause—*cold*, *fatigue*, or whatever *depresses vital power* and produces congestion. This continuing constitutes the cold stage of fever, with weak pulse, cold surface and extremities, general pallor, *malaise*, dejected spirits, and depressed strength. By-and-bye, *reaction* begins, ushered in by rigors, accelerated pulse and breathing, often vomiting and other functional disturbances. Soon the skin becomes hot, the pulse hard, pain is complained of in the head, back, limbs, and throat, with loss of appetite, restlessness, and weakness.

P.—Is it coincident with, or consequent to, this *reaction*, that local symptoms of inflammation exist and become evident?

Dr.—This is a puzzling question, and has long been a bone of contention. I know, of course, how Brossais would answer it; and the odds being so much in his favour, I am disposed to answer it in the same way. But, nevertheless, there is a screw loose in the evidence. There is much very contradictory, but on the whole, much preponderates in favour of Brossais' views. For my own part, I firmly believe, that it is imperfect observation that creates the cases exceptional to his views. However, such as they are, I give you a few facts, Janus-faced, looking to both sides of the question. I should certainly say, that they are at least never antecedent to it—that in the case described a local inflammation is a probable and understandable *effect* of the disturbing cause, and a sufficient cause of the reactionary phenomena. A previously suffering part will naturally, under the reaction, show increased pain, heat, uneasiness. In eruptive fevers, the general disturbance is greatest before the eruption appears. This shows the local inflammation (that of the lining of alimentary tube) to be at its height. When the constitutional endurance is come to the *ne plus ultra*, either the eruption appears—subduing the tumult *by the transfer of irritation to the surface*—or the patient dies. Sometimes the first disorder resembles that of simple continued

fever, merging into inflammatory fever as soon as local inflammation is developed. In other cases, local irritation is pronounced before the symptomatic fever is marked. Fever *generally* is proportionate to the severity of the local inflammation, not *always*.

P.—In the case of local irritation, is the excitement propagated to the heart and arteries, through the medium of the nerves?

Dr.—I should reply yes; but add, not necessarily so. In some cases it is evidently so. But as it is now sufficiently clear how large an element of fever imperfect secretion is, the retention of excrementitious matters in the blood is a sufficient cause of febrile reaction. In these circumstances, the bowels are costive, the skin dries up, the tongue is clammy, the thirst great, and sores dry up. Inflammatory fever is *high* in those of active vascular system. It is *low* in the weak and phlegmatic.

P.—I suppose this it is which makes what you call your *type* of fever?

Dr.—Yes; wherever the powers of the system are low and reaction imperfect, the fever is low, that is, we have frequent, weak, unequal pulse; varying heat of the skin, often with partial sweats; tongue dry, brown, and furred; depression of strength; low delirium.

P.—You will say that these indicate disordered states of the blood, as one prominent cause?

Dr.—Certainly; you may say, perhaps, the leading cause, from its defective purification and *defective circulation*.

P.—How is this made so evident?

Dr.—First, by altered states of the blood particles. Secondly, by the presence of urea. Thirdly, by the signs of incipient decomposition of the blood in such cases, especially in typhoid pneumonia. In the lower forms of inflammation, the fever may be remittent or intermittent.

P.—When inflammations become chronic or are slight, does the fever subside?

Dr.—Unless in organs gravely implicating life, they excite no fever at all. *They generally, however, induce some constitutional disorder, in which defective excretion is commonly a predominant element.*

P.—How do you explain the debility and exhaustion connected with inflammation?

Dr.—Its *rationale* is sufficiently plain. A part that has blood in excess has a tendency to rob other parts of their due share,

especially in anæmic or debilitated subjects, where this loss of equilibrium soonest tells, and can be worst borne. The nervous centres are receiving intelligence momentarily, as it were, that an enemy has made a lodgement threatening the health or life of the individual. This soon produces great depression, fatigue of the functions, and defective nutrition. From time to time the combined powers of the system make attempts at cure by critical actions, or from some imprudence acute attacks supervene. Most frequently the enemy holds his ground. The contest at length is all but given up, and the destructive process submitted to. Nature seems to perceive that violent attempts are vain, and abides the issue. Hence the weak circulation, coldness, disordered functions, gradual emaciation, when a patient long suffers from a low inflammation. The blood becomes progressively impoverished; losing especially its red particles, and the fibrine becomes unorganisable, that is, degenerating into cacoplastic and aplastic matters.

CONVERSATION EIGHTY-FIRST.

Resolution and effusion—Plasticity of lymph, enplastic, cacoplastic, aplastic—Products of inflammation.

PATIENT.—You have adverted to certain results of inflammation as *effusion*, *suppuration*, and *gangrene*. Will you explain these interesting subjects to me in detail?

DOCTOR.—With pleasure; but there is one of the natural terminations of inflammation which we have not adverted to—*resolution*. This we shall begin with. It consists in the spontaneous cessation of the inflammation and the removal of its products. The vessels return to their normal action and dimensions. The obstruction yields. The determination of blood subsides. Simultaneously the fever abates, as marked by the softer and less frequent pulse; the skin moist, or often profusely perspiring; the urine copious and abounding in urea, depositing plentifully as it cools a brick-dust, or branny sediment (lithate of ammonia).

P.—These, I recollect, you before showed were the result of the

decay of the tissues, accumulated in the blood from the defective action of the skin and kidneys, during the period of irritation and mucous engorgement.

Dr.—Precisely. In inflammatory affections, the functions of the kidneys and skin are first impaired. When the kidneys are organically disordered, inflammatory fever is not easily ended. In such cases, broken down subjects usually sink, the excreting organs not being equal to their work. If the resolution is imperfect, a daily remission may take place. We have then, generally, a pink deposit in the urine, containing besides lithate of ammonia, purpurate of ammonia, and lithate of soda.

P.—So much for the natural *resolution* of inflammation. What do you say of that other, of its terminations, *effusion?*

Dr.—It is not *always* a termination. It lowers inflammation; it diminishes the obstruction and determination, but does not necessarily remove inflammation.

P.—What is the effect of an effusion on the structures wherein it accumulates?

Dr.—To oppress and obstruct, to corrode and alter the textures, and of course to prevent function.

P.—What do effusions usually consist of?

Dr.—Liquor sanguinis, coagulable lymph and serum, pus and inflammatory mucus. But I will treat this subject more systematically for you, by showing the nature of *effusions* as they occur respectively in serous membranes, in mucous membranes, and in parenchymatous organs, or the solid viscera, such as the lungs liver, kidneys, &c.

P.—I am all attention; what say you of effusions on *serous membranes?*

Dr.—In acute inflammations in healthy subjects, an exudation will take place (in a few hours often) consisting of serum and concretable fibrine, or coagulable lymph. The fibrine is at first semi-fluid, adhesive, ductile, plastic, being easily stretched into bands, or spread into films, or agglomerated into minute points, forming a granular surface, according as the two contiguous inflamed surfaces permit more or less rubbing motion, and pressure of the effusion, between them. Examples of these occur in the serous coverings of the heart, lungs, and intestines, in the interlobular divisions of the lungs, in the convolutions of the brain, &c.

P.—What does this lymph resemble?

Dr—The white of egg. When first effused it is transparent,

then yellowish and opaque; but the healthier the subject, the more translucent it is.

P.—Is not healthy lymph highly susceptible of organisation?

Dr.—Yes. This is called enplastic lymph. It is at once the *nidus* and the *material* of organisation. The plasticity of lymph depends much on the good qualities of the blood, and on the intensity of the inflammation. Enplastic lymph consists of fibrils of fibrine crossing each other in all directions—striated bands or lines, in short (as you see represented in the wood-cut), mixed with exudation corpuscles, compound cells, with nuclei and granules, and simple granules and molecules. The buffy coat of inflamed blood in robust subjects may be instanced as a good exampler of what I am now describing. It abounds in these striæ and other minute elements of organisation. Healthy blood abounds in red particles as well as in fibrine, and furnishes the most plastic kind of lymph. This separates in the greatest abundance where the determination of blood is most active, and the vessels yet unaltered. This lymph is evidently alive. Its materials arrange themselves into the basis of texture, and blood-vessels form in it, shooting from the adjoining parts.

P.—When the vital powers are reduced, and the blood is poor, that is, deficient in red particles, as you have described it, what sort of effusions have you?

Dr.—What are termed *cacoplastic*. Inflammation is then said to be of a *low* character; its solid products are less capable of organisation. They are of various degrees of structure, of density, and of vascularity. At one time they appear as patches of fibro-cellular or fibro-cartilaginous membrane on the lungs, heart, and intestines, often impeding their functions. At another time, as in chronic inflammations of the intimate structure of the lungs or vessels of the liver, or in those of the peritoneum and arachnoid (membranes of the bowels and brain), the effusion of lymph is scanty and slow. Its deposit usually occurs in granules, or flattened patches, of a yellow or opaque colour, of a tough consistence, and in general totally destitute of vascularity. These are the lowest of organised products, constituting the degenerations termed *cirrhosis* and *crude yellow tubercle*. So low is their vitality, that they are equivalent to foreign bodies, and prove injurious in *three* ways. First, as a source of irritation and constriction to the surfaces on which they are formed, and to contiguous parts. Second, in being little susceptible of absorption. Third, in the ulterior

changes to which they are liable—the cirrhosis to shrinking and contraction, the tubercle to softening.

P.—What is the product of inflammation, which you term *aplastic?*

Dr.—That is, lymph totally incapable of organisation. It is thrown off with the serous liquid in separate large globules, filled with granules and molecules, constituting *pus*, or in detached opaque morsels of *curd.*

P.—Such as we see in scrofulous ulcers, I suppose?

Dr.—Precisely.

P.—What is such matter in its pathological elements?

Dr.—Masses of irregular granules, oil globules, and molecules, held together by a few fragments of fibrils. Besides your own instance, we have this exemplified in the sero-purulent liquid and curdy matter of *low* (typhoid) *pleurisy*, *pericarditis*, and *peritonitis.*

P.—What are the circumstances that make the products of inflammation *aplastic?*

Dr.—Chronic inflammation in subjects in whose blood fibrine abounds, while the red particles are scanty. This is the characteristic state of the blood of the scrofulous and cachectic. It is produceable in delicate people, rigidly subjected to vegetarian diet. In fact, this is my great objection to the indiscriminate recommendation of vegetarianism by its indiscreet partizans.

P.—I am astonished to find that the blood of scrofulous and cachectic people, although deficient in red particles, *abounds in fibrine.*

Dr.—Nevertheless, such is the fact. However the anomaly will be solved to you when I state that this fibrine is of *low* vitality, and susceptible of little or no organisation. It is readily effused in inflammation.

P.—Does the persistence of inflammation lower the plasticity of its products?

Dr.—Most unquestionably. That which is *enplastic* at the outset, ends by being no longer vascular or organisable, as the system gets lowered, and the powers of repair are interfered with.

CONVERSATION EIGHTY-SECOND.

Mucous discharges—Strictures—The skin and its products—Boils—Effusions.

PATIENT.—I AM much enlightened by what you have imparted on the subject of inflammatory effusions, as occurring on *serous membranes.* Will you now explain to me what takes place when they occur on *mucous membranes?*

DOCTOR.—The structure and secreting properties of these membranes being more complex, modify the products of their inflammation. The effusion from mucous membranes microscopically consists of pus and mucous globules, granular cells, granules, and molecules, with more or less amorphous and glutinous mucus, and epithelium scales. At an early stage, *serum* also is present. At an advanced stage, the mucous acquires an increase of fatty matter.

P.—These, I presume, are the constituent elements of what you call your *drains* or *mucous discharges?*

DR.—You infer correctly. Simple temporary irritation of the mucous membranes causes an increase of their natural secretions, only abnormal, however, in containing more watery and saline matters, and fewer globules than usual. If the irritation be continued, and inflammation follows, the secretion is at first diminished by the effusion of serum and pale corpuscles between the mucous and submucous tissues, causing a thickening or swelling of the membrane. Soon, however, a viscid saline effusion distils from the surface, with a predominance of globules and epithelium scales. As the inflammation becomes more intense, the globules increase, and the mucus decreases, but is still very viscid. With the decline of the inflammation, the mucous and saline matters diminish. Globules compose the chief mass of the morbid secretion, bestowing the yellowish, greenish opacity seen in "concocted sputa." This opaque matter is gradually replaced by the natural mucous secretion. In young subjects, as in *croup* in infants, when the inflammation is intense, it penetrates to the tissue beneath: fibrinous matter is then thrown out, forming films or shreds of lymph.

P.—I have heard of instances in which children have had croup

and expectorated a complete mould of the upper air passages. I now understand its formation.

Dr.—But the effused lymph on mucous membranes does not become organised, because it is separated from the vascular tissue by a process of secretion. The exudation corpuscles of inflammatory mucus, therefore, are degenerate or aplastic, and constitute the opacity of viscid mucus, the muco-purulent and shreddy fibrinous matters exuded by inflamed mucous membranes.

P.—Am I then to infer from your doctrine that the opacity and purulence of the effusion from a mucous membrane is a test of the persistence of inflammatory action?

Dr.—Unquestionably, in the chronic state. The globules abound then in the effusion, an impaired product, and one more diffluent supplants the natural mucous secretion. Chronic inflammation is mostly confined to patches, which yield the opaque effusion, while the sound parts secrete natural mucus. Hence the compound appearance of the secretions in chronic inflammation of the mucous membranes, as in those of the air-tubes, bowels, and bladder.

P.—As we are on the subject of mucous passages, you remind me to ask the *cause* of a very common malady they are subject to —strictures? often an agitating question.

Dr.—Inflammation of the submucous cellular texture, and the thickening of the mucous membrane by the interstitial effusion; this remains, hardens, and contracts—hence encroaches on the calibre of the tube.

P.—I understand. As you reckon the skin nearly allied in structure to the mucous membranes, or a convertible tissue, will you here give me some account of its inflammatory products?

Dr.—This is a long subject, and involves the whole pathology of skin diseases. I set aside here, of course, the thousand and one distinctions of writers, which are a great bore, alike frivolous, vexatious, and artificial. Suffice to remark, that effusions on and from the skin may consist of clear serum, with a few exudation corpuscles and molecules, as we see exemplified in the liquid of blisters and blebs, which dries into thin scabs; or in the milky serum, more abounding in corpuscles, which dry into thicker scabs, as in herpes and rupia simplex; or of liquor sanguinis and purulent serum, with more numerous corpuscles, which form very thick yellow or brown scabs, as in rupia promineus, impetigo, and ecthyma. Pustules and tubercle of the skin arise from the effu-

sion of solid matter into its substance. In all cases of inflammation of the skin, the production of epidermis is increased, and is usually thrown off in scales with the scabs, or the cuticle peels off in patches, or it thickens and forms a hard covering, liable to clefts and painful ulcerations, as in psoriasis, inveterate eczema.

P.—Talking of solid effusions into the skin, or on the surface, reminds me of *boils*—always an interesting topic—what is their pathology?

Dr.—This brings me to the question of inflammatory effusions into the *cellular tissue*, which I shall dismiss in a sentence or two, not to fatigue your patience, now hardly drawn on. They consist of serum, with more or less of the exudation corpuscles and fibrine. In diffused erysipelas (cellulitis), the fibrine is deficient, and the corpuscles are degenerate. In *phlegmonous inflammation*, that to which your question refers, there is more fibrine, which circumscribes the effusion, and causes a harder swelling. The most painful and large boils, together with the dangerous and often *fatal carbuncle*, occur in persons who seldom or *never take a bath*, who have lived too freely, take *daily pills*, and neglected the skin.

It is beyond a question that the natural tendency and result of the system of treatment I administer is to improve the quality of the blood. Were this the place, I could give you abundant proofs of it. A medical critic might say that the fibrine is developed by the inflammatory process; so it is when that is so great as to develope general febrile symptoms. But the water boils are seldom attended with any constitutional reaction. So that *that* does not explain the abundance of fibrine in the blood of the water patient. The state of the water patient when he has boils, is an improved state; the consequence is, he does not exhibit the symptoms of illness, but generally walks about, and eats his dinner as usual.

P.—Before we break up this evening's conversation, which has been replete with details of the highest interest, allow me to put a concluding question as to the effects of inflammatory effusions into the solid viscera, or, as they are technically named, the *parenchymatous organs?*

Dr.—They resemble those last spoken of. The organs in question being very vascular and elastic in structure, solid effusions into them may be copious, without causing the tension or pressure

that leads to suppuration and gangrene. The plasticity of its lymph varies the same as in serous membranes. It rarely becomes organised. This is, no doubt, a prospective provision of the Creator to prevent interference with the functions of the organ. Yet limited portions become here and there organised, which portions remain solid and dense.

P.—An exception, I suppose, which proves the rule?

Dr.—Very like it. The matter deposited is in general gradually removed by absorption or secretion, after the inflammation declines. If inflammation continues, the exudation globules and lymph merge into various kinds of pus or tubercular matter, consisting of degenerated corpuscles, granules, and fat globules.

P.—One more last word. Will you sum up the *symptoms* of effusions?

Dr.—They are comprehended in those of inflammation, so closely is the effusion mixed up with that process. They are *swelling*, *pressure*, *obstruction*, *irritation*, *consolidation*, *displacement*, various structural and functional disorders. Effusions aggravate some symptoms and relieve others. When copious, pain, heat, redness and fever, are commonly reduced. Vascular and nervous excitement and determination of blood are lessened; but local and visceral disorders may be increased. The pulse often remains as frequent, but is less hard and full. The fever is of lower degree, or remittent, or hectic. Relief by effusion is greatest in slight inflammations, in which the effused matters can be readily thrown off from the body (as in the mucous membranes), but there is usually much irritation and exhaustion of strength in throwing it off, as occurs by cough, expectoration, diarrhœa, purulent micturition. It sometimes happens in these cases that the effusions do not remove the inflammation. These drains then become all the more harassing.

CONVERSATION EIGHTY-THIRD.

Suppuration—Pus globules—Suppurative diathesis—Abscess.

DOCTOR.—To-DAY we discuss the popular subjects of suppuration.

PATIENT.—*Pus*, or *purulent matter* or *discharge*, is another of those medical "household words" familiar in men's mouths. What is it, and how is it formed?

DR.—PUS is termed *laudable*, or healthy, in proportion as it is thick and opaque, fluid, and free from smell. The formation of such matter, although only fit for expulsion from the body, occurs in healthy constitutions, and is attended with the limiting effusion of lymph. Though prone to decomposition, if excluded from the air, it will remain long unaltered. In ill-conditioned sanious matter *decomposition has already commenced*, as indicated by its fœtor. It is an opaque, greenish or yellowish-white liquid, of the consistence of cream, and of little odour. Its specific gravity is 1030—1033. Chemically, it is composed of water, deutoxide of proteine (forming cell walls), tritoxide of proteine, and albumen in solution, fat, ozmazome, and other extractive matters, and the same salts as in the blood. Microscopically, pus consists of serum and globules, akin to granular cells, or exudation corpuscles. These globules are destitute of cohesion. In proportion as they exist abundantly in fibrine or mucus they impair its consistency. White corpuscles, on the contrary, have a remarkably adhesive and cohesive property. SUPPURATION, or the formation of pus, is a process of liquefaction and disintegration, not merely of the contents of the pus globule, the lymph, and the other products of inflammation, but also of the vessels and structures, which are swept away with the progress of the erosion. This disintegration, according to Mulder, arises from the increased oxidation and diminished vitality of the proteine—that is, its passage from the solid deutoxide to the soluble tritoxide.

P.—How would you define suppuration scientifically?

DR.—It is the process of the conversion into pus of the granular corpuscles of the blood in which exudations abound.

P.—What circumstances favour suppuration?

Dr.—First, intense and continual inflammation. Second, the access of air to the part. Third, peculiar conditions of the blood. The increased afflux of blood to an inflamed part brings more oxygen to its proteine, thus favouring the formation of the solid plastic deutoxide. But if this movement of the circulation be too intense, or too long continued, it is very conceivable how the change in question will be overdone; how chemical properties will take the ascendancy over vital powers; how the excess of oxygen, conveyed by its carriers, the red particles, will oxidise too highly the proteine; in other words, will convert the newly-formed matter from the solid, organisable, plastic deutoxide into the fluid plastic tritoxide—involving in common destruction the recent effusion, the obstructed vessels, and the living textures they are in contact with.

P.—I should infer that this result is more likely to happen in proportion as a structure is highly vascular and complex.

Dr.—Reasonably; as in the true skin, in glands, in areolar tissue in solid organs. For the same reason suppuration is rarer in serous and fibrous membranes. But I have only described one half—*the active half*—of corroding or destroying agency. There is another half—what I call the *passive* active—yet to unfold. It lies first in the obstruction to the passage of the blood through the capillary vessels of an inflamed part; and second, the pressure of the matters effused by the vessels that are the seat of determination. These so lower the vitality of the tissues, that they are unable to withstand the mere chemical action of the effused fluids. The textures, therefore, are gradually disintegrated, dissolved, and absorbed. The exudation corpuscles ooze forth into their place, in the shape of pus globules, from the throbbing vessels leading to the inflamed part. In this centre of morbid operations, the absorbent vessels, veins, and lymphatics remain perfectly free.

P.—Absorption, therefore, will remain active; and this, I presume, accounts for the great loss of substance in suppurating parts?

Dr.—You are quite correct in your inference. It is so—that *is* the cause.

P.—You enumerated the *access of air* as among the causes favouring suppuration. That is, I suppose, on the chemical principle just explained, its oxygenating influence?

Dr.—Yes; and also by the air acting as an irritant to a serous membrane, or an abraded surface.

P.—What is that peculiar condition of the blood you referred to, but did not specify, as favouring suppuration?

Dr.—The facility with which wounds, scratches, and pimples fester, or inflammation not intense, early inducing suppuration, shows a cachectic or ill-conditioned habit of body, or constitution of the blood—*the suppurative diathesis*, as it is termed. This occurs in all those cases where the blood has been impaired by mal-nutrition, profuse depletions, imperfect excretion, or by an actual imbibed poison, that has played havoc with the blood and constitution, as *mercury*, *iodine*, small-pox, glanders, &c.

P.—You certainly put *mercury* in good company!

Dr.—In sooth, but in its proper place. No other poison, or blood-whitening, bone-softening, life-quenching agency, whether pestilence, famine, or the sword, has been more destructive to the human race than the perverse and ignorant *abuse* of that useful and pernicious drug.

I was going to remark that pus also exists in blood (*pyæmia*), *phlebitis* (inflammation of veins), and in diffuse suppuration.

P.—Is not this an *effect* of suppuration, rather than a *cause*—that is, absorbed pus?

Dr.—In many cases, in the majority of cases, no doubt, it is so. But in others it is probable that the granular corpuscles of the blood are there converted into pus globules. However this be, a proneness to take on the suppurative action always indicates an enfeebled vitality—a degraded plasma of the blood; in short, the constitutional powers unable to resist chemical affinities. In extreme cases this is shown by the occurrence of gangrene, which often supervenes in the worst forms of pyæmia, as in malignant erysipelas, glanders, carbuncle.

P.—It is said that some morbid poisons, as the *vaccine virus*, spreads as a ferment. Is it probable that pus in a part, or in the blood, may augment in this way?

Dr.—If any animal poison does, it may. But this leaven idea is not necessary, because the process of cell development is quite equivalent in power of increase, although not so rapid, to anything we know of fermentation. The pus globules are too large to be effused from the blood *as* pus globules.

P.—But might they not make their way through an exposed vessel, or an eroded surface?

Dr.—A very ingenious and plausible solution of the difficulty of the escape of the pus globules, supposing them generated in the

blood. These are the exceptional cases. Ordinarily, however, lay this down as the scientific truth of their origin *that they arise, enlarge, and multiply from exudation corpuscles; that they are found in the midst of lymph and other products of inflammation.*

Suppuration varies much in amount and extent. In cellular structures and solid organs—as the liver, lungs, kidneys—it often occurs as *purulent infiltration*, that is, diffused, uncircumscribed by lymph, but leaving the tissues much softened, but partially absorbed. This result is referrible either to the porous nature of the organs, not admitting of the effusion of lymph sufficient to *limit* the suppuration, or to the *purulent diathesis.* Remember that *coagulable lymph* is thrown out by nature, as a means of *arresting inflammation*, as if it would say, So far, and no farther. One might imagine good old Dame Nature, alarmed at a threatened danger, such as a crack in the building, or a leakage in the cisterns, threatening to spoil her house, hastening at once to open all her available stores of *plastic* materials, and calling up all her forces with their best trowels to use her Roman cement. Sometimes the desired result is happily attained; at others life is only saved in this way at the expense of some, indeed often considerable, inconvenience; as in the adhesions of the pleura and peritoneum, the stiffness of joints, and the exudation in intense croup.

P.—Is *pus*, pure and simple, that is *per se*, a noxious matter?

Dr.—Obviously, to a certain extent. For example, it has the power of chemically dissolving dead animal matters, forming a soluble tritoxide of proteine. In most cases, a font of suppuration is *circumscribed* by a solid effusion. This, I take it, is a prospective precaution of nature to protect the adjoining structures from the devastations of pus, which, so far as it goes, eats as doth a cancer. An abscess, when mature, is a perfect specimen of a collection of purulent matter, thus limited, isolated, or walled in.

P.—Bleeding, I believe, is rare from an abscess, notwithstanding the erosion of vessels and destruction of substance that take place?

Dr.—It is; the blood-vessels of a focus of suppuration are destroyed in common with other textures: *but the supplying trunks are obstructed by lymph.* This is their obturator and the safeguard against hæmorrhage. The walls of an abscess are lined with a coating of organised lymph. The capillaries that remain pervious become dilated and varicose; from these the secretion of pus is

kept up. Hence this lining is called the pyogenic (pus-producing) membrane. As the pus accumulates, the abscess enlarges, and this generally in the direction where there is speediest outlet or the *least resistance*, that is, of some cutaneous or mucous surface.

P.—Fibrous and other hard textures, I presume, then, resist the progress of abscesses, and the escape of pus?

Dr.—You are right. The parts in this case are put on the stretch, with much painful sensation; their vessels are, of course, compressed and obstructed. The result is obvious, namely, the vitality of the tissues is diminished: the supply of protecting lymph, which limits the extension of the abscess in other directions, fails to be effused. At this part the abscess is said *to point*. The thin partition dividing the sound from the suppurating ulcerates, and the pus is discharged. As the escape of pus from an abscess into a serous sac would be necessarily fatal, nature takes a similar precaution to that noticed above, namely, the plastic effusion glues the serous surfaces together, and the contents of the abscess pass through them, without any risk of entrance into the dreaded serous cavity. Thus abscesses of the liver and of the kidney perforate the peritoneum, and are evacuated by the intestines; or they make their way out through the walls of the abdomen; or they even find vent for themselves by eating their way through the diaphragm, pleura, and lungs.

P.—How does the healing process take place in abscesses?

Dr.—An abscess does not necessarily heal on emptying itself. Once opened, it may continue to discharge pure pus, or depraved pus—pus diluted with serum or sanies. In healthy subjects, healing takes place by contraction and a filling up process, an increased effusion of lymph in the interior of the abscess, and the growth of new vessels in the form of granulations. A thin layer of pus is still formed, however, by the degeneration of the exudation corpuscles of the surface. If this purulent remnant finds free vent, then the growth of the granulations and the *contraction of the walls* will speedily obliterate the cavity of the abscess.

CONVERSATION EIGHTY-FOURTH.

Ulceration—Doctor-making—Harvey and circulation of the blood—Suppuration, local and general symptoms.

DOCTOR.—To-day I shall have something to say on a still more popular topic than even that of yesterday's conversation—*ulceration.*

PATIENT.—Will you then please to begin by giving me a definition of an ULCER?

DR.—*An abcess that has discharged its contents.* The term commonly implies, however, a limited inflammation of the skin or mucous membrane, whose normal nutrition, and thereby its natural cohesion, is impaired; so that patches of the tissue are broken up, and either absorbed or carried away in the pus discharged.

P.—Well, a gap or excavation is left. Pray what happens then?

DR.—This "gap," as you phrase it, is technically called *a solution of continuity*, from whose surface oozes pus or serum mixed with exudation corpuscles, and occasionally blood particles. Ulcers tend to spread by this process; or they cicatrize by the effusion of fibrine on their surface, and the development of vessels therein in the form of granulations, which are the plastic materials of the regenerated structure. Ulcers vary in the nature of their secretions, the conditions of their walls, and the symptoms they produce. But these matters belong to SURGERY, and we shall resume them in our surgical conversations.

P.—I shall be glad when we arrive at the "*household water-cure surgery*" department, I have no doubt I shall be highly interested; I hope you will make it highly useful, and come out strong.

DR.—I fancy I have some genius in that direction; but in this country there used to be no opening for the surgical aspirant; I suppose you know how hospital appointments used to be made?

P.—I know. Talent, industry, and genius carried all before them, as they should do in a free and enlightened country. Interest and nepotism went for nothing. *Humanity* was all in all! excuse my irony.

DR.—You should understand, that a man may be a physician without knowing much of surgery, or having many of the gifts

required by a first-class surgeon, who devises new operations and executes them perfectly. But, be assured, you would be better, *if there should be much the matter with you*, without the surgeon who has *not* received a physician's education.

P.—A run of three winters at Glasgow or Edinburgh, a grind and a degree, I should hardly imagine would be *per se*, a matter for a conscientious or an honest man to boast of, or for a patient to place much hope in.

Dr.—Still I should think it was safer for a sick man to fall into the hands of a doctor with such a poor preliminary, than the care of one possessed of the more prized and *recherché* degree of Oxford or Cambridge, who was *liable*, if the "Lancet" reports truly, to prescribe an ℥j. for ʒj. of laudanum, and so give his patient a longer sleep than he intended.

P.—This must have been from the absence of all *practical* instruction—cramming Latin and Greek, and leaving physiology, pathology, and therapeutics to their fate, or the *bonne volonté* of the student. I see the *real* Dr. comes *after* the degree, if at all.

Dr.—Just so. The result of this make-believe doctor-making, or *sham*, as Carlyle would call it, was not to the advantage of the patient, as you may suppose. A medical man's education should be practical as well as theoretical. There should be but one standard of qualification, one well concocted plan of education for all students—one title, that of Dr. of medicine and surgery. When a man fairly gains this, then let him devote himself to any *spécialité* he pleases. I could give you endless illustrations to show you how much this is called for; a modern instance will suffice. Only a few months ago, I called on an old patient in town. The lady requested me to see her *favourite* maid, "dying of the dropsy," and although, as she said, the celebrated Dr. —— had just been there, it would be *a satisfaction* if I saw her. I found the patient, aged twenty-three, in much pain, and looking extremely ill; she was taking a mixture of digitalis, nit. of potass., liq. ammon. acet., and æther, which pervaded the room with a professional odour. Being in a hurry, I proceeded to examine the abdomen, when the sick maid said "there was not the least occasion," but in doing so I at once perceived unmistakable symptoms of something more than *dropsy*. I sent for Mrs. ——, and explained myself; the maid *angrily protested*, and Mrs. —— cried, "*Impossible!*" "Well," said I, "scold as much as you please, but be

quick, and get a ticket for the lying-in-hospital, for you have no baby clothes, and there is barely an hour to spare."

P.—Who was the eminent physician?

Dr.—Never mind; but, if you insist, I will tell you in *confidence*—the who, the when, and the where.

P.—But, on the whole, matters are *now much* changed for the better. Why do you not present yourself to be made one of the honorable fraternity of the *London* College of Physicians—a renowned body?

Dr.—I intended to have done so, and there is nothing I should like better, if they would publish the examination, and give the casting vote to any real water-doctor.

P.—Some fine day they will want some of you to *examine on the water-cure treatment*, and I predict that the time will not be so far distant as you imagine. It is well known that many doctors are dabbling in the water-cure, and freely prescribing many of its processes in private practice, often *mal à propos*. I have no doubt they must soon come to it regularly, and acquire a competent knowledge of its many valuable means and appliances, which they might use with such immense advantage for their patients. Eh! doctor?

Dr.—You are over-sanguine; no doubt it will be so when the pressure from without is sufficiently great. That may not take place until *we* have passed into the land of shadows, or when people are talking of the *late* Malvern water-doctors and their doings. Now give heed, and learn a lesson from the past. When Harvey discovered and *demonstrated* the circulation of the blood, "no physician above the age of forty years believed him." I cannot say that I have found the case so bad with the water-cure, for I find the doctors above forty more *clairvoyant*, especially if *retired* from the cares and fatigues of practice, or the anxieties of *seeking for it*. You can easily imagine some of the strange and erroneous ideas the medical men of those days must have formed of the human body, before Harvey's immortal discovery, that during life the arteries were full of blood, and that it was always circulating!

P.—What then did they think the arteries contained?

Dr.—The arteries, which, as you know, carry on the red blood, are elastic contractile tubes; after death they are found empty, the blood having all passed into the veins. Being seen thus *empty*, they were said and supposed to contain during life the *vital or animal spirits*, which took their departure with the breath

and the soul. Woe to the medical man who dared dispute this long established dogma! Harvey was born to explain the mistake, and demonstrate the beautiful mechanism by which the divine and wondrous device is accomplished, of the blood-current making its *perpetual circle* in our living frames—often, as we know, flowing on without a moment's arrest for more than a hundred years.

P.—I look upon HARVEY as one of the chosen instruments of Providence. I suppose he was soon noticed, appreciated, and honoured by the profession?

DR.—Yes, he was soon noticed, in this way—he was all but martyred. Alas! good easy man, devoted to science and humanity, he little anticipated the storm, pelting and pitiless, he had raised, to burst remorselessly on his defenceless head. Soon as the discovery was seriously talked about, the clouds began to lour and threaten. He was reviled as a dreamer, a destructive, a charlatan, and *denounced as an infidel.* He soon lost all his practice, and no respectable physician could be expected to meet him. An *individual* like this, who could not only throw a doubt on a fundamental belief, consecrated by ages and sanctioned by generations of medical men, but could also, regardless of all caution and humbug, adduce and publish his proofs—surely he was a fit subject for the worst that could be done to him.

P.—*Black* spirits and *blue*, *white* spirits and *gray!* I see the dilemma. What were the old colleges, and the old and young doctors of those days, to do *without* their *animal* and *vital spirits in the arteries*, the existence of which in such a locality, Harvey with audacious boldness dared to deny. Did they not get their living in some measure by these arterial spirits, and, I dare say, there were a thousand and one remedies to be found in the college parmacopœia, devoted to these animal and vital spirits,—with, moreover, the books of "elegant prescriptions," *real* and *infinitesimal*, ready at any moment to be used as a charm, to cure the vagaries, and cheer the ups and downs of the disturbed "*arterial spirits.*" I now see exactly the painful though unavoidable position of the immortal Harvey.

DR.—The lesson is a grave one, and teaches us forbearance and patience with poor humanity; but, nevertheless, fully justifies our continued detestation and contempt for all—humbug.

Let us now, if you please, leave matters which are somewhat irrelevant to our present subject.

P.—*Eh! bien, revenons à nos moutons.* You have intimated

that local inflammation lies at the foundation of ulceration. It is this, I presume, that produces the hardened basis of many ulcers?

Dr.—Truly; by the solid deposit poured out among the structures implicated. The ulceration commences in the centre of this induration, because here vitality is at its minimum; nutrition being almost null, from the compression of the vessels, and the interruption of the circulation at that spot.

P.—What has an impoverished or depraved condition of the blood to do in the production of this result?

Dr.—Much, and this without any previous distinct induration or inflammation. For the parts most predisposed, or that suffer most, are those which have become congested by posture, as in the cachectic ulceration of the legs, in the ulcers on the sacrum of the bed-ridden and reduced; or those most remote from the nourishing influence of the blood, such as the non-vascular textures, the cornea, and cellular parts of cartilages. In cases of extreme anæmia, where the fibrine and albumen of the blood are very defective, ulcers of this kind arise.

P.—If I recollect rightly, Magendie states these symptoms to have occurred in animals fed exclusively on sugar, starch, and other non-azotised articles of food.

Dr.—He does. The destruction of textures is explicable on the principle above adverted to, that the wasted materials of the body being replaced by plasm of deficient renovating power, the new structures are much below par in point of vitality. Hence, on the one hand, the feeble resistance to the chemical action of the oxygen of the blood; and on the other, the facile solution of parts scantily supplied with blood.

P.—I suppose the same explains the local softening of textures called *ramollissement*, or softening, a term I have often heard applied to disease of the stomach and brain.

Dr.—Yes; the same changes as those that induce ulceration, but lesser in degree and more limited in space, that is, it is at once an effect of inflammation. Moreover, that altered condition of the blood which favours ulceration, operating more diffusedly or on a larger scale, produces general softening of the textures. This softening of the brain, liver, muscles, and mucous membrane, sometimes results from an impoverished condition, or imperfect supply of blood in those parts. Inflammation, which farther impairs and deranges the supply, may immediately determine the softening process.

P.—What are the *local* symptoms of suppuration?

Dr.—The occurrence of suppuration is marked by a diminution of the heat, pain, and other signs of irritation, and increased action in the part. The pain often changes into a simple throbbing, the swelling is softer and yields under the finger, and presents the fluctuation of fluid matter. The inflammatory redness of the skin diminishes, or is superseded by a pale yellow or mottled colour. As the abscess approaches the surface, a pale spot is seen at which it bursts.

P.—The symptoms of inflammation are alleviated, therefore, on the occurrence of suppuration?

Dr.—Yes; but this is only among *yeilding* parts; because the painful tension and swelling are diminished. But among unyielding parts, as under the nails, the dense investing membrane of muscles (fasciæ), or of bone (periosteum), &c., the tension is increased rather than lessened, and the pain and irritation are aggravated. The pus is effused under these dense membranes by the powerful hydraulic pressure of the heart. The local tension and suffering occasioned thereby is increased by the swelling of the pus globules, by endosmosis.

P.—On this showing, I conclude, that the free secretion of pus from mucous membranes relieves their inflammation?

Dr.—Yes; it removes the superfluous products and the submucous deposit, and therefore restores the parts injured.

P.—But you have admitted that suppuration is essentially a process of destruction. Its products you show are noxious. The tendency of the whole then must be depressing and exhausting to the organic powers?

Dr.—You are quite right. It is an effort of the system that had better be avoided. It is nature doing the best in trying and difficult circumstances, choosing the least of two evils.

P.—What are the *general symptoms* of suppuration?

Dr.—With the occurrence of suppuration inflammatory fever subsides, the general excitement yields to weakness and exhaustion. The pulse loses its force but retains its frequency. The heat diminishes or alternates with chills and sweats. The general redness is succeeded by pallor or hectic flush. The urinary deposit is pale or pinkish, the *débris* of plastic matters, or tissues wasted during the inflammatory process. These changes may occur after inflammation, without suppuration. They are proportionate to the extent of suppuration, and the importance of the organ affected.

P.—The constitutional symptoms, therefore, must be very intense and formidable in the cases you have described, where the suppuration is diffused without a limiting barrier of lymph?

Dr.—They are so. These formidable cases of inflammation occur in areolar texture, skin, and serous membranes. The pulse becomes frequent and weak; the tongue brown and dry, or coated with an offensive fur and tremulous; the perspiration is profuse; the urine scanty and high-coloured, sometimes fœtid, often suppressed. Putrid diarrhœa often sets in, attended with hiccup, mental depression, and occasional delirium. The patient becomes agitated and restless; the breathing is hurried and sighing.

P.—You have said enough. The rest is better conceived than described. But how long does this killing process take? and what is the sort of cases that are disposed to this form of suppuration?

Dr.—Dissolution may take place in from one to four days. The same symptoms occur in suppurating inflammation of the veins; in injuries of the head ending in suppuration, opening into the venous sinuses. This sinking occasionally supervenes when an external abscess subsides without opening, or in which a copious suppurating discharge suddenly ceases.

P.—What are the marked pathological lesions usually found in such cases?

Dr.—*Firstly*, a general fluidity of the blood, and the gravitative congestions and stains thereby induced. *Secondly*, purulent deposits in the viscera, especially the lungs and liver, with inflammatory injection and deposition of lymph around the collection.

P.—Do not you think it probable that the formidable symptoms, in these cases, result from pus absorbed into the circulation, and arrested in the lungs and liver?

Dr.—Pus is unquestionably detected in considerable quantities in the blood. It may be that in such cases an abcess or purulent font (deposit) has opened into a vein, and so introduced the pus into the circulation.

P.—You said that the pus-globule was too large to permit its absorption through the entire walls of the blood-vessels?

Dr.—Therefore it must be formed within the vesels of an inflamed part, when not introduced through crowded vessels. This occurs in suppurating phlebitis (*pyæmia*), in cases where the vitality of the blood is impaired, and there exists a proneness to the formation of pus from trivial causes. It occurs sometimes

after scarlet fever, in acute albuminuria, in typhoid rheumatic fever, in metroperitonitis, and in malignant erysipelas.

It seems to me probable that the rigors, and other symptoms of depression, or *low* irritation, which mark the progress of extensive local suppurations (as those of the lungs), may arise to a certain extent from the presence of pus in the blood. When suppuration continues long, as from extensive wounds or ulcerations of the skin and mucous membranes, there is great wasting of flesh and strength, with hectic fever. This is *remittent*—the exacerbations recurring once or twice daily, beginning with chills and depression, followed by quick pulse, and partial flushings of the cheeks, hands, and feet, ending in profuse perspirations. Pallor, cachexia, emaciation advance *pari passu*. The rapid decomposition and removal of the tissues that waste the patient is evidenced in the colliquative sweats and diarrhœa, the vomiting and aphthæ of the mouth, that characterise the closing days.

CONVERSATION EIGHTY-FIFTH.

Mortification—Gangrene—Sphacelus—Sequelæ of inflammation.

Doctor.—Yesterday's discussion brought us to the subject of gangrene (mortification), this I shall dismiss in a short conversation to-day.

Patient.—You incidentally brought gangrene on the *tapis* before as one of the results of inflammation—that which ends in the death of the part. But suppuration also involves the death of the part. What distinction, therefore, do you establish between them?

Dr.—Your remark is not without point. Herein lies the distinction. In suppuration, the decaying textures are softened and displaced by pus as fast as they die. In gangrene, the textures die more extensively than pus is formed, and they are decomposed without being removed. In limited gangrene, the dead part is dissolved away at its circumference, by the inflammatory exudation

at its living parts. It is thus separated or *sloughed* from them. If the dead portion be extensive and the vital powers low, the separating process will not be effected before decomposition ensues. This is technically *gangrene* and *sphacelus.*

P.—What tends to produce or predispose to gangrene?

Dr—Whatever directly lowers or destroys the vital constitution of the solids and fluids of the body, notably by whatever obstructs the circulation of blood in a part.

P.—How is the circulation in a part most frequently destroyed?

Dr.—By long-continued pressure, by severe contusions, lacerations, or other mechanical injury; by extreme heat or cold; by strong chemical agents; by the compression of soft parts exercised by the solid matter effused in the early stages of inflammation; by excessive congestion; by extreme weakness of the heart in its structural diseases, in low fevers, in states of great exhaustion; by ossification or partial obstruction of the arteries supplying the remote parts of the body. In the category of causes must also be reckoned strong poisons, as arsenic, sulphuretted hydrogen, the virus of venomous animals, plague, malignant scarlatina, small-pox, erysipelas, hospital gangrene, glanders.

P.—Besides the loss of feeling and other vital properties, which in the nature of things must belong to a gangrenous part, what are its salient characters?

Dr.—The colour of the part becomes livid, leaden, or greenish, or almost black. The cuticle rises in blisters, and exhales an offensive odour. These changes are relative to the warmth and moisture of the adjoining parts. In *dry gangrene* the dead portion becomes horny and black, instead of putrefying.

P.—*Apropos* of putrid or dead matter, how does it affect the living body?

Dr.—It has a twofold operation. First, as a *general sedative;* secondly, as a *local irritant* at the same time. Its symptoms vary according as one or other of these two elements or operations predominate.

In the robust, healthy, and well-fed person, active inflammation and effusion of lymph is aroused round a dead part, so as to isolate it from the system, and to protect the latter from its infection.

P.—What are its predominate symptoms?

Dr.—Those of inflammation and of inflammatory fever. The dead part is soon thrown off in the form of a *slough*, or the liquefied in the inflammatory exudation poured forth; otherwise

the system soon suffers from the poisonous and prostrating operation of the dead matter, and this the more readily, if the dead part be in the interior of the body. In the feeble, the cachectic, the anæmic, or those whose blood is deficient in plastic materials, adhesive inflammation is with difficulty established around a gangrenous focus.

P.—In such cases, I should presume that the putrid or typhoid phenomena show themselves earlier, and prove more speedily fatal?

Dr.—They do; there is an increased feebleness and frequency of the pulse; reduction of fever, collapse and pallor of the countenance; cold sweats; brown, dry, or clammy foul tongue; low delirium; restlessness, agitation; hiccup; fœtid diarrhœa; urine offensive or suppressed; coma, or syncope, and death. In superficial parts, or on those communicating with the surface, a putrid odour exhales from a gangrenous mass; sometimes the whole body exhales a fœtid odour.

P.—I suppose in the case of the lungs this taints the breath and the expectoration?

Dr.—It is unmistakable.

P.—Does the supervention of gangrene always terminate the pain and other severe symptoms of inflammation?

Dr.—Generally; producing an illusive lull before death. It is, however, often replaced by a distressing nervous agitation.

P.—This conversation must close for to-day. I am obliged to you for having so fully entered into the details of the sequelæ or results of inflammation. It has much enlarged my comprehension of diseased operations. I have just one parting question to put. Do these result isolatedly, that is, one in one case, another in another?

Dr.—No. They are often found all co-existent or combined in different portions of an inflamed organ or tissue. Thus *resolution* is but rarely without some *effusion*. *Lymph* bears often the characters of *pus; suppuration* is frequently associated with effusion of *lymph; abscesses* are not unfrequently attended with *gangrene* and *sloughing* of parts. All this is expressed in the technical terms of pathology, as *purulent lymph, flaky pus, sloughing ulcer, gangrenous abscess.*

CONVERSATION EIGHTY-SIXTH.

The varieties of inflammation — Effusion of lymph — Poisonous influences — Characters of scrofula.

PATIENT.—I HAVE heard much of the varieties of inflammation, I am anxious for the pleasure of hearing you explain that subject at length.

DOCTOR.—The pleasure is reciprocal.

P.—What are the circumstances that give their peculiar or distinctive characters to inflammations?

DR.—Many. First, the nature of its exciting cause; secondly, the excess or defects of certain of its elements or results; thirdly, the co-operation of other elements of disease. The following are specific varieties of inflammation: STHENIC and ASTHENIC; ACUTE, SUBACUTE, and CHRONIC; CONGESTIVE; PHLEGMONOUS; ERYSIPELATOUS; PELLICULAR or DIPTHERITIC; HÆMORRHAGIC; SCROFULOUS; GOUTY; RHEUMATIC; SYPHILITIC; BLENNORRHŒAL.

P.—I should be obliged to you to give me a few remarks on each of these varieties.

DR.—That is all that my time permits; the object of these introductory conversations justifies no more. They are only a bait to lure you on to research and right thinking.

P.—Well, what of this *sthenic inflammation*—propound?

DR.—This is marked by a strong hard pulse, high fever, very fibrinous blood, great activity of inflammatory phenomena, with usually a copious effusion of plastic products. This is a disease of robust subjects.

P.—Who used to be thoroughly drained and depleted under the old system of treatment?

DR.—And who certainly sometimes had their inflammations speedily "knocked down," as it was phrased.

P.—And, I suppose, their constitutions for ever afterwards pretty well "knocked up?"

DR.—That was indeed often the result. Many who had been robust subjects previously ceased to be so afterwards. But, excuse me, this is rather diverging.

P.—The *asthenic* inflammation I need hardly ask about; I am now so familiar with the terms.

Dr.—This occurs in those of poor blood and low tone of vascular and muscular systems. The pulse is only occasionally affected, and then in frequency rather than in strength and firmness. Fever, if present, is slight, or remittent, or low. Its products are scanty, or of cacoplastic or aplastic nature, or the effusions are watery, akin to drains and dropsies.

P.—Your *acute*, *subacute*, and *chronic* inflammations are more nicely drawn distinctions.

Dr.—Yet, after all, they are very arbitrary and conventional distinctions. They are terms applied to inflammation, chiefly in relation to its duration, but occasionally in the sense of sthenic and asthenic. Acute inflammation may be *sthenic;* commonly it is so; but it is not necessarily so. Its distinctive character, or inherent tendency, is to be of short duration, because it is intense. Being intense, it speedily results either in *resolution*, *effusion*, *suppuration*, or *gangrene*, and in a period varying from a few days to about three weeks. An inflammation lasting above three weeks or a month is termed *subacute*. If protracted beyond six weeks it is reckoned as properly *chronic*.

P.—But is not asthenic inflammation also often short in duration?

Dr.—It is. Whilst chronic inflammation may often present a great deal of the sthenic character.

P.—So that really the *sthenicity* or *asthenicity* (if you will allow me these terms) of an inflammation is not a question of the *time* as of the *manner* of its existence?

Dr.—You are very near the mark. It is an affair of individual stamina, whether the constitution sets up the sthenic or the asthenic forms of inflammation. It is a question of the relative strength or weakness of the organic powers.

P.—By this rule I should suppose the acute inflammation, especially if extensive, to be attended with considerable symptomatic fever or constitutional disturbance?

Dr.—It is. In subacute inflammation the fever subsides, or may disappear completely. With chronic inflammation there is rarely fever, unless in cases of deep structural degenerations, when a distinctly remittent or hectic fever prevails. The products of acute inflammation are copious and distinct coagulable lymph, pus, inflammatory mucus, &c. In subacute and asthenic inflam-

mations, they are intermediate in character,—the more in quantity, the worse in quality, as purulent lymph, curdy matter, tubercular matter.

P.—Is chronic inflammation of chronic character from the beginning, or does it often originate in the acute or subacute forms?

Dr.—It takes its rise occasionally in the former way, but most frequently is the sequela of unrecognised, masked, or maltreated acute or subacute inflammation, the local obstruction and excitement of vessels persisting, after the other results and usual terminations of inflammation have taken place.

P.—Is chronic inflammation ordinarily asthenic?

Dr.—Yes; for the most part. But there may be often extraordinary local excitation and determination of blood.

P.—I suppose that, because of its less intensity, it will offer much less functional obstruction, or general derangement, than acute inflammation?

Dr.—You are right; but what it lacks in energy, it makes up in duration, thereby determining permanent and irremediable alterations of structure. The common products of chronic inflammation—the effusions in serous membranes especially—are always either cacoplastic or aplastic. These constitute dense adhesions, or false membranes of fibro-cellular, or semi-cartilaginous substance, as cirrhosis, grey miliary tubercle, curdy and yellow tubercular matter.

P.—What is the effect of chronic inflammation in mucous membranes?

Dr.—To cause them to secrete muco-purulent or curdy matter, to thicken them, and to ulcerate them. The submucous tissues become the seat of deposition, which, on becoming organised, often contracts, forming strictures and obstructions in the mucous passages. These lead to dilatation above them. Consolidation and induration are common results of chronic inflammation in glands and other complex structures. The effused matter so hardened, afterwards contracts and obliterates the intervening tissues, producing the changes in the lungs, liver, and kidneys, I have often adverted to, called *cirrhosis*. Sometimes the indurated parts, from pressure on their vessels, become softened (as in *ramollissement* or softening of the brain), or suppurate and ulcerate (as in excavations of the lungs after chronic inflammation).

P.—Chronic inflammation you said induced *hypertrophy*. Does this take place in all structures alike?

Dr.—No; this deposit of nutritive material is irregular. It abounds more in some tissues than in others, most in the interstitial, cellular, or filamentous tissue, which encroaches on the vessels and other structures, causing their atrophy and partial obliteration.

P.—What is the effect of chronic inflammation of cartilage (gristle) and bones?

Dr.—Effects analogous. In the former it produces *caries* or decay, and *ossification;* in the latter it causes *caries* and *exostosis*, or irregular and excessive bone growth.

P.—What have you now to say of chronic inflammation of the skin?

Dr.—It leads to *induration* and *ulceration.*

P.—These opposite results of inflammation, at one time hardening, at another time softening, tissues, present to me a paradox, which I dare say my meek and amiable wasser-doctor will straightway explain.

Dr.—The compound character of inflammation, and the varying proportion of its elements and products explain the apparent paradox. The long persistence of chronic inflammation permits by accumulation the development of these opposite results. For example, the hypertrophy arising from one element, I mean determination of blood, increases another of its elements, that is, vascular obstruction, which produces the opposite of hypertophy, that is, *atrophy* and *ulceration.*

P.—I should like to hear you describe *congestive inflammation*, which I see marked on your tablets.

Dr.—It consists in the accumulation and delay of blood in the vessels of an affected part predominating over determination of blood. It is commonly asthenic in character. It arises from the causes of congestion, the inflammatory action being imperfect or partial. Its symptoms are more of congestion than inflammation. There is little heat, pain, fever, irritation, or increased action. The redness is more marked and deeper than usual, and if the affected organ be a very vascular one, as the lungs, liver, or kidneys, the swelling or engorgement is considerable.

P.—*Congestive inflammation* I should then rank with the subacute or chronic?

Dr.—You are right; from its not tending to speedy results. Its solid effusions are cacoplastic. Its solidification is of a dense or indolent kind, tending to contract, and to degenerate into aplastic

matter (tubercle). Inflammation of the lung supervening on disease of the heart, on bronchitis, and asphyxia, is *congestive inflammation*. So is inflammation of the liver from any cause.

P.—Now I see we have come to *phlegmonous inflammation*. What have you to tell me?

Dr.—It is that accompanying a phlegmon, furuncle, or *boil* of the integuments. It is abruptly circumscribed by the effusion of solid lymph, which ends the inflammation by suppuration, or by slow subsidence as in what is called blind boil. Inflammation is rendered phlegmonous by a highly fibrinous condition of the blood. It is mostly taken on by the cellular and parenchymatous tissues. It is usually sthenic in type. Even where it results in suppuration and sloughing, it bars the introduction into the body of the baneful pus or dead matter. Its symptomatic fever inclines to the inflammatory. The local pain, heat, and irritation are considerable.

P.—In your enumeration of the various kinds of inflammation, you mentioned the erythematic or erysipelatous. What is its nature?

Dr.—It tends to spread, because it is not attended with the *effusion of lymph*, which is thrown out to *bound* inflammation, as I told you before. This rapid increase and production of lymph, which we observe in severe or dangerous inflammations, Macartney, our gifted professor, would impress upon us as one of the beautiful provisions of provident nature, and I might add of benevolent *design* in the great Creator of all. In severe forms, it is accompanied with much redness, smarting pain, heat and swelling. The effusion is serous, or sero-purulent, and raises the cuticle in blebs or blisters. In the worst forms it terminates in diffused suppuration, sloughing, or gangrene. The fever is of a low type, being attended with great weakness, disordered secretions, foul dry tongue, confusion, dullness of senses, delirium, &c. In *bad* cases, all the symptoms of the worst typhous fever may be present, that is, muttering delirium, dry brown tongue, sordes on the teeth and lips, convulsive twitchings of the limbs, fœtid or suppressed excretions, sinking, &c.

P.—But do not typhoid phenomena always indicate something more than common results of inflammation. It appears to me as if there was in addition the operation of a poison?

Dr.—True; it does appear so, and this probably is the infectious principle; and this explains why persons much immured with

such patients are oftener attacked than others. Bad air and crowded wards of surgical patients, will at any time convert common inflammation into the erysipelatous. This is favoured by some unknown epidemic condition of the atmosphere. In such cases, the product of inflammation becomes a sort of animal poison, acting, first, as a local irritant, and then being absorbed as a general sedative.

P.—You say that it is really the condition of the system that determines the character of the inflammation?

Dr.—In a great measure. The effects of the impression produced in the system by the entrance of these injurious matters, and the general and local reaction against them, conduce to the varying degrees and forms of erysipelatous inflammation and its fever. The poison acts on the constitution often before the local inflammation appears, showing itself in fever, rigors, vomiting, headache, quick pulse, delirium. Weakly people, and those with structural disease, especially of the kidneys and digestive organs, chiefly suffer from the worst effects of erysipelas.

P.—This shows the essentially depressing operation of the poisonous influence. What evidence does the blood show of a poison in such cases?

Dr.—Pus globules are found in the blood of parts even remote from the affected localities. Pus may become undoubtedly a very poisonous matter. Pus globules do carry with them a septic (putrefactive) influence. The *liquor paris* is fetid and pernicious. It may spread in solution or in vapour through the economy. Some asthenic inflammations of mucous and serous membranes, and of internal organs, exhibit many of the constitutional effects of the worst forms of erysipelas. *They* often prevail, when *it* is epidemic, and may be traced to the same infection. This is the case with puerperal metritis, or inflammation of the womb, and peritonitis, erysipelatous tonsillitis, and laryngitis, and suppurating phlebitis.

P.—The next in your list of inflammations was the *pellicular* or *diptheritic*. I am not aware of having heard of that kind before.

Dr.—Its name is not so much of a household word. It is akin to erysipelas, being diffused and spreading, generally asthenic, and accompanied by a low kind of fever. It is attended rather with *malaise* than pain, with a little swelling and deep redness early obscured by a film of greyish albuminous matter exuded on

the inflamed surface. It is often seen on the tonsils in sore throat, and mistaken for sloughs. In epidemic scarlet fever, diptheritic inflammation affects the whole throat, involving the mouth, gullet, trachea, air tubes, and even extending into the alimentary canal. In many cases these films of lymph are very fœtid; always more or less so, as if from incipient decomposition, favoured by the air and moisture they are exposed to in the respiratory passages.

P.—This tendency to putrefactive results in inflammation shows a low vitality of the powers.

Dr.—Very true; and is a cause of further depression. The exudation of fibrinous matter is evidently referrible to asthenic inflammation of the submucous areolar tissue, being at the same time diffused like erysipelas. The more sthenic inflammations, are often circumscribed by the effusion of lymph, causing a thickening of the membrane.

P.—You illustrated before the effusion of this fibrinous matter in croup.

Dr.—It is to be seen in the branch-like moulds of the smaller air-tubes that appear in that disease, in pneumonia and bronchitis; in the skin-like shreads from the bowels in dysentery, and after the irritation of purgatives, without symptoms of active inflammation, that is, from congestion. The thinness of the mucous membranes in children, and in the smaller air-tubes, facilitates this transudation of fibrine. Hence, at an early age, all such inflammations cause a ready effusion of albuminous matter. In the mouth and throat various asthenic inflammations cause fibrinous exudations. For example, that from the action of mercury, and in the white curdy coating of the mouth and throat (aphthæ) of adults, occurring towards the fatal termination of various chronic diseases. The microscope shows in some such cases occurring in adults, the fibrine to consist of a convervoid vegetable—a parasite composed of jointed tubes, and brilliant sporules and granules. The aphthæ of children are different, being vesicular elevations of the epithelium, with or without an albuminous film beneath.

P.—You talked of *hæmorrhagic inflammation;* have you any remarks to favour me with?

Dr.—It is asthenic in character. Its subjects are scorbutic persons, or those affected with purpura. In such cases there is distinct evidence of defective action of the liver and kidneys. Hæmorrhagic pleurisy and pericarditis occur in conjunction with

cirrhosis of the liver, and granular kidney. An altered condition of the colouring matter of the blood, more than a deficiency of its fibrine, lies at the foundation of this. Sometimes there is so much colouring matter in an inflamed tissue and its products, that it is doubtful whether the case be one of hæmorrhage or of inflammation.

P.—*Scrofulous inflammation* is a more familiar phrase. This is that which occurs in persons of the scrofulous diathesis or constitution?

Dr.—Yes; in such people, inflammation usually runs a course, and leads to results, different from those of inflammation in healthy persons. It is usually more asthenic, more subacute, more chronic in character. Its solid products are not enplastic, as in the healthy, but cacoplastic or aplastic, according to the intensity of the scrofulous diathesis, the textures affected, and the amount of effusion. Where the scrofulous disposition is best developed, there its inflammatory products are most abundant, especially if the inflamed tissues are internal and do not freely discharge outwardly—there, also, will the *material* be most degenerate, aplastic, consisting of scrofulous pus or yellow tubercle, utterly irregular in structure and insusceptible of organisation. Being unfit for absorption it is to all intents and purposes a foreign body, or at least acts as such, irritating, compressing, and obstructing the adjoining parts, interrupting their functions, altering their structure.

P.—In this way, I suppose, originate scrofulous or tubercular deposits and abscesses, as those we see often disfiguring the subjects of the disease in question?

Dr.—Just so; the lymphatic glands, and also the bones, cartilages and areolar tissue of such people evidence the disease especially. Other forms of it are, the tubercular infiltration of the lungs, and the deposits in serous cavities, they are subject to.

P.—You admit that there are cases of the disease less intense than others. What is the character of the products in such cases?

Dr.—The effusion is slow and moderate, and is merely cacoplastic, that is, it is susceptible of a low degree of organisation, as grey, miliary, and tough yellow, tubercle; cirrhosis; atheroma of arteries, fibro-cartilage, and other degraded living solids.

P.—In these cases, I presume, an altered nutrition is the chief cause?

Dr.—It is the mainspring from which it flows. I was going to

remark, that the aplastic nature of the inflammatory exudations in scrofulous subjects is shown in other forms. The synovial membrane of the joints is softened into a brownish pulp (Brodie). The articular cartilages and cornea ulcerate from absorption predominating over nutrition. Small cutaneous tumours or tubercles inflame and ulcerate in the face and other parts; for want of plastic material the ulcers are phagedenic, spreading destruction to all adjoining parts (*lupus*).

P.—I am, then, to set down the peculiar character of scrofulous inflammation as that which perverts, degrades, or arrests nutrition, by supplying a material not organisable, or hardly so?

Dr.—True. You have a clear idea of its nature. How widely it deviates from the common form of inflammation, is exemplified in lymphatic glands. In common inflammation these become hot, painful, and swollen, and soon end in resolution or suppuration. In scrofulous inflammation, on the other hand, the lymphatic glands swell to a great size; they often present a deep red surface, with little pain or heat. The swelling remains for an indefinite period, without either resolution or suppuration; and is little influenced by antiphlogistic remedies. The suppuration not unfrequently seems to advance to a certain point. There is a fluctuating swelling and a livid surface, as if the abscess was ready to burst. Afterwards the skin becomes wrinkled, and the swelling subsides. When such abscess is evacuated, the pus is serous and curdy, mixed with soft cheesy (tuberculous) matter. This sort of abscess leaves a deep ulcer, with a narrow orifice (a fistula) indisposed to heal.

P.—What is the condition of the blood in scrofula?

Dr.—There is an excess of fibrine, with a deficiency of red particles. This is the state induced in many people by what is called vegetarian diet. I am decidedly of opinion that the red flesh imparts red particles, and if used in moderation, and of wholesome quality, will go a greater way in keeping them up to the normal standard. But the fibrine of scrofulous blood is deficient in fibrillating structure. This is the grand test and attribute of high vitality. I am quite convinced, from experiments, that under *rigid* vegetarian diet, the fibrine of the blood becomes deficient in febrillating power, and therefore the vital plasma lowered in character. The exceptions to this are young children, who have ample air and exercise, and robust men who have the keen appetites and the capacious stomachs of labourers. In all other cases, in

your shop-confined middle class, those pent up in towns, those worn with intellectual toil or anxiety, the slaves of domestic drudgery, in all these cases, pure vegetarian diet will induce, sooner or later, according to the individual's stamina, this deficiency of the red particles of the blood, and this below-par state of its fibrine. All may go on pretty well so long as the equilibrium of health is maintained, which is certainly favoured by the regular habits of vegetarians in other respects, and their abstinence from intoxicating liquors. But let the equilibrium of health be once deranged by any accident or exposure, then they run the gravest risks.

I attach great importance to the red particles of the blood. They are of infinite importance in preparing a highly vitalised *plasma*. Where they are deficient, it is always malelaborated. How deficient they are in your thorough vegetarians is sufficiently evident in their pale looks. The immense supplies of oxygen taken by children in their incessant activity where they have free scope would almost itself vitalise their blood, if it was extracted from the least nutritious elements.

P.—I suppose the microscope throws some light on the intimate nature of scrofulous matter?

Dr.—It does. It shows, first, a scantiness and irregular form of pus globules; second, a relative excess of granular matter, loose, or coherent in clots; third, oil globules in considerable numbers. This accounts for its aplastic or indolent character. It wants the organisability of fibrine, and the cell-forming and endosmotic power of pus. As such cold abscesses wax older, the pus globules become collapsed, from the absorption of their liquid contents, the matter acquires the consistency of cheese or putty; and, in progress of time, this degenerates into a fatty matter and a chalky matter (phosphate of lime).

P.—What do you suppose most impairs the integrity of the fluids in such cases?

Dr.—*Courses* of mercury, iodine, &c., which have a notable effect in breaking up the blood globules,—malnutrition, cachexia, *chronic digestive derangements*, inflammations of the intestinal canal.

P.—I can easily conceive their operation in vitiating first the *fluids*, and then the *solids*. Are there any certain outward characters which mark the existence of scrofula?

Dr.—No infallible outward characters. Many who present

its alleged characters are without the disease, and many who are afflicted with the disease want its more evident characters. These are flabby relaxed muscles, soft transparent skin, fair or pale complexion, with partial patches of a peculiar pink, or purplish redness, pearly whiteness of the eye and teeth; tumid upper lip; fair or reddish hair, large and weak joints, precocious intellect, and often the most amiable and engaging disposition.

P.—Is not scrofula a decidedly hereditary disease?

Dr.—It is. The disposition will be developed in children from mere constitutional feebleness in the parents, whether such be congenital, or induced by disease, by excesses, or by age. It will appear also in the apparently robust children of remarkably robust and healthy parents, as I have unhappily reason to know in a near connexion; this often fatal disease being, in such cases, inherited perhaps from the grandfather or grandmother on one or both sides.

P.—*En definitive*, what would you say then are the circumstances that most favour the development of the scrofulous diathesis?

Dr.—All causes that tend to weaken the system—especially when they are long continued, as poor or insufficient nourishment in childhood and youth; cold and damp situations; deficient clothing; long confinement in close ill ventilated habitations, protracted illness, especially from eruptive or typhoid fevers, and last, but not least, after *severe and continuous digestive disorder.*

P.—What are at least the most constant concomitants of scrofula?

Dr.—Various signs of weak circulation and imperfect nutrition, such as cold extremities, feeble and easily excited pulse, small development of muscles, uncertain digestion, and irregular excretion, slow or defective healing of wounds. Yet these symptoms are often present without the existence of scrofula.

P.—But I suppose occurring all together they must be very suspicious signs?

Dr.—Unquestionably; and every precaution should be had recourse to where there is such threatening. Great care should be taken that the patient is not submitted to *experimental* water treatment. I have seen instances where harm was done that should have been avoided. But in *many cases* a cure is impossible, and all drug medication or water treatment is in vain, except as a palliative. All rough measures are highly reprehensible.

CONVERSATION EIGHTY-SEVENTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Gout and rheumatism—Morbific matter circulating in the blood—Structural alterations or organic diseases—Their nature, causes, origin, progress and terminations.

DOCTOR.—TO-DAY I will dismiss in a few words the subjects of GOUTY and RHEUMATIC, and of SYPHILITIC and BLENNORRHŒAL INFLAMMATION, and afterwards, shall proceed to the DISEASES of NUTRITION.

PATIENT.—The specific cause of gouty and rheumatic inflammation, a morbid matter in the blood or tissues, you have already adverted to. Gout and rheumatism must be considered, I suppose, a sort of *Siamese twins* in their way, inseparably bound together, and kindred in nature?

DR.—True. A metaphor not wide of the mark. This ground we shall not tread over again. I dismiss the subject with the remark that it is probable that the pecularities of many cutaneous inflammations are referrible to a morbid taint. I have little doubt but that *urticaria* or nettle rash, eczema, psoriasis, erythema, may be, to a great extent, the deposit of a morbid matter from the blood on the parts affected, or a *specific irritation* of those parts by circulating morbific matter. This is kept in progress by irritation of the digestive apparatus, and often serves as a transfer of the excess of that irritation.

I shall now have something to say to you about organic or structural diseases, that is, disordered nutrition. What I have told you hitherto of the proximate elements of disease, of the disorders of the blood and its vessels, has been merely introductory to the *structural alterations* or *organic diseases*, now to occupy our attention. Now you will find the advantage of the analytic method I have adopted, of having studied the anatomical elements of the body severally in their morbid conditions, as muscular fibre, nervous matter, areolar tissue, &c., the aggregate of which, their combined and complex result, constitute *organic disease.*

P.—I quite understand you, and quite appreciate the benefits

of your method. A diseased mass of any sort, an indurated or a softened organ, an hypertrophied or an atrophied structure, a tubercular or a cancerous mass, presents itself to us as a *compound of altered elements*—muscular fibre, nervous matter, areolar tissue, &c., the whole inextricably matted together, and combined into one solid mass. Now I can easily conceive the utter impossibility of making me or any one else comprehend the nature of this mass, without having previously imparted a clear idea of its constituent parts, by explaining them one by one.

Dr.—You are now prepared to follow me with advantage through the interesting details of structural diseases. *Full* details I cannot promise to give here; because these belong rather to the province of morbid anatomy, and are more fitting for the lecture-room, where the teacher is well furnished with morbid specimens to hand round his class. Perhaps I may some day lecture to my patients with wax models, after that fashion too; for that perhaps you will find is my *fort*. As in physiology, I have refrained from giving more anatomical details than were necessary to understand any given function explained; so in pathology, I must limit myself to such details of morbid anatomy as are necessary to make clear the general principles of the science. What most concerns us, what I am most anxious about, what most agrees with the object of our conversations, and what the general reader will best understand when these conversations are published, is to show *how*, that is, *by what alteration or perversion of nutrition, the chief forms of organic disease are produced.*

P.—Organic diseases, then, are a modification of the function of structural nutrition?

Dr.—Yes; all organic diseases are comprehended under the generic character of disordered nutrition. This may be, first, *excessive*, as in *hypertrophy;* second, *defective*, as in *atrophy;* or third, *perverted*, as in *induration, softening, tubercle, cancer, cirrhosis, fibro-cartilage, atheroma, calcareous matter*, cysts, tumours, hydatids, entozoa.

P.—I should exceedingly like to hear the details of the *nature, causes, origin, progress*, and *terminations* of each of these.

Dr.—That we shall come to by-and-bye.

P.—Is there any classification into which you divide your structural lesions?

Dr.—I do not attach much value to classifications of this sort. The whole affair of medical nomenclature and classifications is

as uncouth and barbarous as it is false, frivolous, and often vexatious. They are of not the least practical importance. Take, for example, the faults of nutrition, or the results of inflammation; the one produces the other, merges into the other, co-exists with the other, or succeeds the other. If classification served any purpose, you might divide structural lesions into, first, those which are produced by inflammation; secondly, those which arise independently of distinct inflammation, that is, which are simple modifications of the normal process of nutrition.

P.—What is the source of malnutrition, or what starts it?

Dr.—This is a comprehensive question; I must refer you to the constituent principles of the blood, its organisable materials, its proteine, its oil, its red and pale corpuscles, its liquor sanguinis, its cell-germs, its nuclei, its plasma. From these the materials of the solid textures are furnished. The activity of the plastic process depends on the quantity of the blood; the healthiness of the plastic products on the quality of the blood. Of equal importance are due circulation, respiration, and excretion, that is, the vitalising and purification of the elaborated fluids. But nutrition itself, in all its stages, is a vital process. The progressive development of the nuclei, or germs of cells, their growth into cells; their power to separate or secrete certain matter from the blood liquor; their faculty of self-preservation and of reproduction; these are all properties peculiar to living matter, and are ultimate facts or elements in physiology. You must refer again to the elucidation of these matters in our familiar conversations on physiology, and must again study their *laws*. They will reveal corresponding elements in pathology, and shed much light on the origin and nature of structural diseases. A defect in these attributes of life is a source of malnutrition, and furnishes a primary element of disease. From this element, from this starting point, the vital process of growth or repair deviates or fails in one or more of its stages, rendering the new materials unsound, and unfit to form part and parcel of a vital tissue or organ.

P.—I am to understand from this, that morbid changes of nutrition depend on morbid variations in the quantity and quality of the ingredients of the blood, or from defects in the changes it is subject to in the glandular or eliminating apparatus of the body?

Dr.—Even so; well understand and recollect this proposition, that organic diseases are essentially connected, first, with derange-

ment of the supply or preparation of the blood (that is of the *digestive organs*) ; second, with defects of its constitution, altered proportions, and properties of the elements of the blood; third, with disorders of the circulation, too feeble, or too active, febrile, inflammatory or congestive states ; fourth, with defects of its purification, diseases of the eliminating organs, of the liver, lungs, kidneys, skin, bowels ; fifth, the *nervous influence* probably affects nutrition, through altering the circulation. A moderately active circulation and rich blood favour nutrition ; poor blood, and too active or too feeble circulation, impedes it; these causes *tell* on the whole frame, but affect some textures more readily than others, and this for various reasons ; some because they are more susceptible of impressions than others, their sensibility is more exquisite, their irritability more intense ; others because their nutrition is more active. In proportion as nutrition is active in a part, so much the more readily is it influenced by variations of the normal process. Thus fat and areolar tissue are increased or diminished sooner than muscle; muscle, again, sooner than tendon; and tendon sooner than bone.

P.—I suppose it is for similar reasons that degenerations and other changes of structure, as tubercle and cancer, affect some parts in preference to others ?

Dr.—It is ; structural diseases *are* commonly *partial*, from causes existing in the part. Those causes are most commonly such as to affect the circulation of the part, so that local anæmia, congestion and determination of blood, and inflammations, however induced, are the most frequent causes of partial organic alterations. We remark the same of disordered secretion, and other elements of disease.

P.—This makes clear the local causes of structural changes. But I should think that the general element, the disordered blood, is quite as potent in its influence.

Dr.—Truly, in all bad cases ; in clear degenerations, as tubercle or cancer.

P.—What part does the influence of the nervous system play in structural changes ?

Dr.—You have an illustration of this in a paralysed limb ; not being exerted, it is not so freely supplied with blood.

CONVERSATION EIGHTY-EIGHTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Hypertrophy—Daniel Lambert and adipose tissue—Elephantiasis—Fat paunches, and a course of water curing.

DOCTOR.—THE preliminary ground of yesterday being now gone over, we are prepared to enter systematically into our subject, and, therefore begin with *increased nutrition* or HYPERTROPHY. This implicates either, first, entire tissues, or second, entire organs. In the first case it is called *simple hypertrophy*, and is then to be considered as an ultimate element of disease. In the second case it is called *compound hypertrophy*, and is then a proximate element of disease.

PATIENT.—Hypertrophy is always a partial disease according to the principles you have laid down?

DR.—It is always. Even the unwieldy mass of a Daniel Lambert is only the overgrowth of one part of the body, of one tissue, the *adipose*. Beyond a certain fulness of texture, varying with the state of health, or peculiarities of constitution, growth stops. There is no more increase of size. The superfluous nourishment increases in the blood-vessels, causing plethora.

P.—I suppose you have a healthy hypertrophy, that of the *voluntary* muscles, the result of exercise?

DR.—Yes, with alternate repose and proper blood; as we see in the arms of the blacksmith, the lower limbs of the dancing master; but when it affects *involuntary* muscles, it is chiefly morbid. Thus, in the heart, it results from continual excitement in robust subjects. From the violence of its impulses and propulsion of blood, it produces much functional disorder. The muscular fibres of the bladder become enlarged from diseased prostate gland, or other obstruction in the urethra; those of the stomach from stricture or disease of the pylorus; those of the bronchi in spasmodic asthma.

In true hypertrophy there is an increase of the amount of the proper tissue. For example, hypertrophy of the interstitial areolar

tissue of the lungs and liver occurs after long-continued congestion from diseased heart. *Elephantiasis* is an illustration of hypertrophy of the areolar tissue of the lower extremities.

P.—By that rule, corns and callosities of the skin are simply instances of hypertrophy of the epidermis or cuticle?

Dr.—Precisely so; from irritation or pressure determining the blood to the part. So, in the chronic inflammation arising from psoriasis, chronic eczema, and impetigo, the cuticle is retained and thickened; from its stiffness it cracks or *chaps* into fissures (rhogades). In more temporary or superficial excitement, congestion, or inflammation of the skin, as in erythema, lepra, pityriasis and scarlatina, the superfluous epidermis peels off in films or scales. Ichthyosis is an extraordinary instance of hypertrophy of the cuticle. Its scales accumulate in a solid state like fish scales, whence the name of the disease.

P.—You said that the skin and mucous membranes, that is, the outer and inner linings of the body, were virtually identical, in structure, often indeed, convertible the one into the other. If so I am curious to know whether the mucous membrane has any diseased states analogous to hypertrophy of the cuticular covering of the skin?

Dr.—They have their precise analogues. It must be observed, however, that the secretion of these inner membranes being fluid, the nucleated cells, which on the skin indurate and form solid scales, are here thrown off in the mucous, which presents an increased number of epithelium scales, as well as the mucous cells, and a viscid amorphous fluid.

P.—You mentioned that disorder of the mucous membranes not unfrequently co-exists with cutaneous disease?

Dr.—The two membranes, I have no doubt, are vicarious, the one performing, or supplementing the office of the other when obstructed by disease. You see this sympathy, or reciprocity of action, illustrated in exanthematous diseases. Simultaneously with the appearance of the *rash* the internal malady is mitigated; with its retrocession it is aggravated. That which allays intestinal irritation diminishes the intensity of the rash, the fever, and other symptoms. That which augments the irritation increases the rash, or repels it altogether. *Chronic irritation* of the alimentary canal, particularly of the digestive part, is the mainspring of most skin diseases. On the other hand, as an illustra-

tion of the influence of the skin on mucous membranes, you have *psoriasis* and *lepra* giving rise to bronchial congestion and viscid secretions.

P.—Now will you please to explain compound hypertrophy?

Dr.—It is that of entire organs. When healthy it arises from the more copious flow of blood to them in connexion with their increased use. For example, the uterus is hyperthrophied in pregnancy; the breasts during lactation. One kidney is enlarged when its fellow is incapacited by disease.

P.—In that case the brain will be more developed in proportion to active exertion of mind?

Dr.—It is so. This may go on to hypertrophy, if inflammation, congestion, or some other vascular disorder does not occur. The size of the brain being thus too great for its bony case, it compresses the vessels, becomes indurated, and, as a necessary result, its functions are proportionably impaired. In precocious or highly trained children, the brain is disproportionately developed, is over-nourished, in fact, and its functions are accordingly perverted. Of this injudicious premature culture, fatuity and coma are common results.

P.—That is the reason why *early prodigies are sure never to be late ones.* A "young Roscius" cannot become an old one; nor an "infant Sappho" an adult Sappho.

Dr.—Truly said. The mucous and cutaneous follicles are extraordinarily developed by continual excitement. The *bursæ* (mucous glands) are enlarged in situations exposed to pressure; as on the shoulders of porters, on the knees of housemaids, on the elbows of miners, on the ankles of tailors.

The hypertrophy of the liver, and spleen in protracted ague (*ague cake*), is referrible to the frequent repetition and long continuance of the enormous congestion this disease induces in those organs by the violence with which the blood is driven in during the cold fits. The same efforts result from protracted exposure to cold and wet, in short, from whatever determines long congestions.

P.—From what you have said, hypertrophy is not always referrible to external causes.

Dr.—No: but to a peculiar state of the circulation of the affected organ, to unusual nutritive energy in the part. To this is owing the enlargement of the thyroid gland in bronchocele—Derbyshire neck, as it is sometimes called. Fatty hypertrophy of the

liver, and of adipose tissue, often results from large quantities of fat food, or from the defective elimination of fat from the system.

P.—So that the increase of fat is to be viewed less as the indication of vital activity of nutrition, than of a predominance of its chemical elements in the blood?

Dr.—Generally it is so. Nevertheless there is a class of cases that form an exception to this rule. These are the least numerous. Such people tend to enormous obesity on the sparest diet, and in spite of at least *ordinary* exercise.

P.—That is, you mean to say, that sufficient or more *violent* exercise would keep it down?

Dr.—It would. But such is not always unattended with danger. I know nothing equal to a course of the water-cure for reducing unwieldy dimensions, large and pendulous abdomens, and restoring the general health at the same time. The great activity of the absorbents and the eliminating apparatus, that takes place, renders this system of treatment the *safe* mode of substituting compact, firm, elastic *flesh*, for unwholesome, oppressive, flabby *fat*.

CONVERSATION EIGHTY-NINTH.

PATHOLOGY, OR THE NATURE OF DISEASE.

Atrophy—Causes of emaciation.

Patient.—I am anxious to hear all you have time to communicate on the subject of *atrophy*, or *diminished nutrition*.

Doctor.—This may have the appearance of a general disease; all parts of the body may waste so much as to impair their functions. This constitutes general *atrophy*, *marasmus*, or *emaciation*. A large amount of structures is removed by decay and absorption without equivalent repair. The equilibrium of *decay* and *renewal* is lost. The vital affinities that kept every part *in situ*, and in

due quantity and quality, cease, although the constituent molecules are in a constant state of transition. They obey the common chemical affinities which tend to dissolve and remove them.

P.—In our physiological conversations, I recollect, you laid stress on the fact, that the atmospheric oxygen introduced into the circulation was the grand destructive or decomposing agent.

Dr.—It is so; but the nutritive or reparative process countervails this. The incessant deposition of new materials, replete with energetic vital affinities, keeps *repair* co-equal with *waste;* thus maintaining the integrity of the structures and functions of the organism.

P.—Tell me now what are the causes of this dreaded atrophy?

Dr.—Whatever reduces the vital powers; whatever promotes decay; whatever prevents repair. Among these are severe and continuous exertion, bodily and mental; excitement; want of sleep; anxiety; protracted sorrow and suffering. In such cases we may have sheer wasting without chronic inflammation or actual disease. The urine contains an excess of urea, resulting from the decay of the textures; it is often alkaline, and unusually prone to decomposition. The intestinal and cutaneous secretions are highly fœtid, from the same tendency to putrescence. A low or hectic fever is the *consequence* of these changes, although it is often mistaken for the *cause.* The rapid decomposition and removal of the textures wherever large suppuration is going on, explain the characteristic *hectic fever* of such patients. *A morbid matter is always in a course of elimination from the blood.* Marasmus from excessive secretions and drains is the result of the same exaggerated decay. Not only nutrition is perverted or paralysed, but the decay of the tissues is accelerated. This is shown in the increased amount of urea excreted. Fevers and various acute diseases exhaust the vitality of the textures and promote their decay.

P.—How is it, then, that as the disease declines, the emaciation becomes most obvious? This is a common remark I have often heard made, without being followed by any satisfactory reply.

Dr.—The reason of this is, that the absorbents then enter on their greatest activity; collecting everything they can get hold of to stop the breaches, and that may be turned to account in repairing the damages of the previous conflict.

P.—What are the causes which derange or prevent repair?—in other words, what are the causes of emaciation?

Dr.—They are such as occur in all stages of the nutritive process; as food deficient in quantity or quality, food malelaborated in some or all of its stages. This malelaboration occurs in dyspepsia, diarrhœa, disease of the mesenteric glands intercepting the supply of chyle to the blood, in perversion of the assimilative process by which the chyle is converted into blood (*diabetes mellitus* and *chylosus*), and in defects in the plastic elements of the blood, the fibrine and the albumen tending to pass into decomposition, as in malignant fevers, or to concrete into unorganisable forms, as tubercle. Another cause you will find in excessive discharges of various animal fluids, as blood, pus, serum, milk, mucus, &c.; also in morbid growths which unduly interfere with or appropriate the nourishment of the body, as tumours, cancer, &c. Lastly, parasitical vermin, as worms and hydatids.

P.—I suppose if the cause can be distinctly traced, the emaciation will be a true index of the extent of its operation on the body?

Dr.—In a great measure; and there is rarely extreme marasmus without structural changes which render its continuance permanent as carcinoma of the stomach, or some other organic or incurable disease.

P.—Is atrophy often a partial disease?

Dr.—Very often; as from defective supply of blood to a part, or from disuse of a part. The eyes waste in blindness; the muscles waste in paralysis and anchylosis; the mammæ waste by age. Atrophy often succeeds to changes induced by inflammation or organic disease. The compression of the vessels of a structure, resulting from an effusion, by impeding or preventing the supply of blood, produces atrophy. This is illustrated in the cacoplastic products of inflammation and congestion, as in cirrhosis of the liver, granular disease of the kidney, or pleuro-pneumonic consolidation of the lung. These deposits, in hardening, shrink in size, and therefore contract and compress the vascular tissues, cutting off its supplies of blood. In the lungs the textures become thin and emphysematous. In chronic pneumonia and phthisis, many blood-vessels in the lungs become obliterated, and the texture wastes or degenerates, according to its condition, or to individual constitution. Atrophy of the heart and brain is connected with ossification and partial obstruction of the arteries supplying them.

P.—What do you mean by *perverted nutrition*?

Dr.—Altered *quality* of the texture, new structures, growths, or deposits superimposed upon the old. They imply partial hypertrophy and atrophy.

CONVERSATION NINETIETH.

Indurated and softened tissues—Causes of softening.

Patient.—You have often referred to *indurated* and *softened* tissues. I should like to hear explained, and to understand these two important processes.

Doctor.—*Induration* results from the increased deposit of solid matter in a structure, or from its compression, or both. It usually depends on chronic inflammation, which causes a continual overflow of solid nutritive matter; but it often occurs without obvio us inflammation, or merely with some of its elements. Thus a gland often becomes hard without inflammation, cartilage becomes bone. An exaggerated nutrition of a part often takes place from prolonged determination of blood simply.

P.—I should imagine that the exuded matter in indurations would be of low vitality?

Dr.—Unquestionably, very low; it is simply granular or hyaline matter, deficient in cell-germs and fibres, and hardly, if at all, organisable. The result is not increased, but perverted, nutrition of the part. Similar effects are produced in the lungs by the compression of effused liquids or of a solid tumour, especially when the lung is inflamed. Pressure prevents the full development of the exudation corpuscles. The hardening of cartilage by osseous deposit is a *tranformation* rather than simple induration. Induration of the liver and kidneys imply interstitial deposits and other changes of structure.

P.—What are the causes of the softening process?

Dr.—Various, according to the textures it invades. In bones it is from the deficient deposit of the earthy matter (the sulphate

of lime) which confers their solidity. In the stomach after death, it is from the solvent action of the gastric juice, paralysis from lead; poisoning produces softening of the muscles. The softening of the muscles, &c., in this case, probably, and in febrile, anæmic, and cachectic states, is from deficiency of fibrine in the blood.

P.—No doubt; because it renders difficult the repair of the fibrinous or harder parts of the soft solids.

Dr.—Just so. These parts, therefore, present a loosened or semi-dissolved state. In the intemperate and the cachectic, the fluids and solids are pre-eminently depraved. With diseased liver and kidneys, there is a general softening of the textures, which, under the microscope, present an excess of oil globules.

But I was proceeding with my enumeration of the causes of softening. Atrophy from defective supply of blood is one; in this state of matters a part decays and is absorbed faster than it is repaired. Other examples of this are softening of the brain and heart from ossification of their arteries. We have partial softening, like atrophy, following inflammation from obstruction of vessels. In this way softening of portions of the brain follows meningitis; softening of the heart succeeds to pericarditis, or inflammation of the sac containing the heart; softening of the stomach and intestines succeeds to gastro-enteritis; softening of the articular cartilages to their inflammation.

P.—In all cases, then, of partial softening, the chief cause is a local one?

Dr.—It is so, but favoured, remember, by an aplastic condition of the blood. I have no doubt that, in a great many cases, the latter was the result of the *over* depleting and starving treatment of inflammation once so general.

CONVERSATION NINETY-FIRST.

Transformation of structure—Fatty degeneration.

DOCTOR.—To-day I shall enter with you on a most important and interesting branch of pathology, that of *transformation* and *degeneration* of structure.

PATIENT.—Before you begin, let me hear you define such transformation?

DR.—The replacement of one element of structure by another. The term *degeneration* is also applicable to this change, for the substituted texture is commonly lower in vitality. Thus mucous membrane may be transformed into skin, and *vice versâ*. The exudation corpuscles of the cuticular lining are the same in both; only in the case of the skin they dry into epithelium scales; in the case of the mucous membrane they retain their soft, moist, globular state. Muscular substance is transformed (after inflammation of the adjoining parts) into fibrinous or fibro-cellular texture. Loss of muscular substance is always replaced by this fibro-cellular texture, never by new muscles or flesh.

P.—What are your divisions of degeneration; how many specific sorts do you reckon?

DR.—FOUR. First, FIBROUS; second, GRANULAR; third, FATTY; fourth, OSSEOUS or CALCARIOUS. In the order in which they are named they represent a descending scale of vital power of chemical composition, and of physical condition.

P.—The fibrous degeneration, then, is the most animalised, I perceive. What tissues does it chiefly implicate?

DR.—The muscular textures, from chronic inflammation in or around them. Thus the muscular structure of the heart is affected after endo and pericarditis. Muscular fibre generally degenerates in this way from rheumatism. The tough, sinewy, and wasted muscles of old animals are instances of this sort of degeneration. This abnormal tissue resembles the tendinous and fibrous structures of the body. It consists of coarsely knit bundles of coarse fibres, with fewer nuclei and fewer blood vessels pervading them. They tend to still lower degradation in the animal scale, to granular, fatty, and osseous.

P.—In what organs do you find this fibrinous degeneration?

Dr.—In the spleen, liver, kidneys, and lungs, a filamentous tissue supersedes their natural structure. As there is increased density of these organs, the new fibrinous matter is to be viewed as interstitial deposit rather than transformed tissue.

P.—You have often alluded to the granular degeneration, that is what you call in your elegant language, *a cacoplastic deposit?*

Dr.—Exactly so, effused in the interstices of a texture, and exhibiting a granular composition. It often occurs with augmentation of substance under the deteriorating influence of malnutrition, chronic inflammation, and old age. The fibrous and elastic tissues, especially of the arteries, tend to this degeneration. Its effect is to impair their cohesion and transparency, disposing them to stretching, laceration, and rupture. It constitutes the first stage of further degeneration into fatty and calcareous matter.

P.—What does the microscope reveal in regard to this structure?

Dr.—A remarkable increase of aggregated granules, with corresponding diminution of the fibrous or filamentous tissue. The granules are not highly refractive. There are no free oil globules. In this respect it differs from fatty degeneration; neither is it so opaque or fragile as the true fatty atheroma. The granules are probably a transition stage between the fibrous and fatty, or osseous degeneration. They are found in arteries which present both these changes, as if they represented an intermediate condition. Cacoplastic deposit and recent lymph often degenerate in this way.

P.—What have you to explain or communicate about the fatty degeneration? Does it differ from ordinary fatty accumulation?

Dr.—Yes, decidedly. The latter is simple hypertrophy of the adopose tissue or fat cells. The former is a regular transformation into fat of the proper tissue of muscle, liver, or other structures. The fibres themselves become pale in patches or spots. Under the microscope they exhibit fatty globules or crystals within the sarcolemma. As the change increases, the colour, consistence, and power of the muscle are all reduced. This occurs in the heart, often in the decline of life in connexion with weak constitutional powers and faults of nutrition. The celebrated Dr. Chalmers died of this transformed structure of the heart. In such cases the arteries exhibit atheromatous patches, that is, fatty matter de-

posited in a granular and globular form, under their inner lining, and partly at the expense of the middle coat, which it substitutes.

P.—I have heard that the liver is peculiarly subject to this fatty degeneration?

Dr.—True. It is clear to me that the liver is the grand eliminator of fatty matters over and above what is not stowed away in the shape of adipose tissue; hence the fatal liver disorders of Europeans in hot climates, who usually consume immense quantities of fatty and other carbonaceous matters, only fit for the diet of the most rigorous northern climates.

Fatty degeneration of the liver is characterised by the pale opaque appearance of that organ, its soft greasy consistence, and its low specific gravity (it floats in water). The liver cells naturally contain a considerable proportion of oil globules (Bowman). An increase of this normal constituent pressing on and causing atrophy of other tissues will determine fatty degeneration. It is a reasonable conjecture that this fat is the bile in the process of formation by the secreting cells.

P.—Is this fatty degeneration the result of an error of the particular function or organ implicated?

Dr.—It is not likely. It occurs so often in other organs at the same time without any marked development of the common adipose texture, as to show that it must originate in some peculiar chemical constitution of the animal solids or fluids, or in some peculiar digestive derangement. I incline to the latter hypothesis in the case of fatty liver, because that viscus is, as it were, the great estuary into which all the blood of the digestive canal passes before it is admitted into the course of the grand or general circulation. The whole portal system is an *imperium in imperio.* Some have imagined that fatty matter is taken into the blood during the rapid decay of the textures, and is conveyed to the liver as the proper excreting organ of such substances. But the fact alleged here is very questionable, if not positively false. I believe that fat, *quoad* fat, is never absorbed from the *débris* of wasted structure, it is absorbed in its elements, hydrocarbon. In the next place, if it ever be absorbed as fat, it is the office of the lungs and skin to eliminate it in the shape of hydrocarbon. Besides it could only find its way to the liver by the route of the few scanty arteries that go to nourish the tissues of the liver, not to furnish the *materiel* of its secretions. I repeat, what I have

attempted to prove elsewhere, that the grand function of the liver is to eliminate the superfluous hydrocarbon of the alimentary mass while yet in the digestive tube, before it is sent to head-quarters to be made blood; accordingly we find that an excess of fatty matters in any particular meal at once determines a bilious attack, and this *before* the materials of such meal are converted into blood. Every one must have experienced this in himself.

P.—You said that fat globules are abnormally predominant in various organs without any development of the common adipose textures?

Dr.—This further proves my position; in all these cases of fatty viscera, I believe it will be found that the liver is primarily or principally, implicated in the disease. This is remarked in the habitually intemperate and cachectic. It is the usual associate of granular kidney. The increase of fat globules in the epithelial cells of the kidney is a prime pathological character of its granular condition, according to some observers. This corresponds to the fatty liver, and coincides with it. In all these cases the chief cause must be looked for in the diseased state of the liver; if it cannot eliminate the superfluous fat globules of the food, neither can the system stow them away in the shape of adipose tissue. There is no alternative for them, then, but to get abnormally "fixed" in various organs, hence the disease usually apertains to many textures. So important a part of the digestive apparatus as the liver cannot be disabled, without a general malnutrition resulting, which tends, among other things, to substitute this abnormal fatty matter for the proper tissue of organs. Hence, in these cases, the viscera present an unusual predominance of oil globules, with some degree of softening, and the *yellowish pallor* common to ill-nourished tissues. The liver, spleen, and kidneys, even the muscles, have a dingy red, or yellowish brick hue. There is a similar tendency in the products of inflammation and other deposits. Opaque exudation corpuscles are found in great abundance in lungs affected with *low* inflammation (especially chronic), and in gangrene (Gulliver); consisting chiefly of oleine and margarine (Davy).

The pus of old abscesses, mature and softened tubercles, the fibrinous vegetations on the valves of the heart, and the softened fibrine found in the blood-vessels, or on serous surfaces long inflamed, all these also contain a large proportion of fatty matter, in a solid crystallised, granular, or liquid form.

P.—In our physiological conversations you remarked that albumen was chemically convertible into oil.

Dr.—This is an invaluable fact, and one that explains much of the morbid degeneration. I am, as you perceive, at unusual pains to develope and explain to you, because it is much mixed up with the diseases of declining life, or of constitutional break-up in those who induce *early age* by *early excesses*, or habitual intemperance. Adipocere is formed from animal flesh, kept moist without the access of air, that is, its albumen and water are transformed into fat and carbonate of ammonia.

P.—What is the cause of fatty degeneration?

Dr.—Fatty degeneration is a sure sign of the predominance of *chemical* over *vital* affinities. As a constitutional affection it implicates many organs, as has been seen, and is always found in connexion with enfeebled circulation and lowered respiratory powers; it is, therefore, found in advancing age. An excess of fat (cholesterine) is found in the blood of aged people. It is favoured by whatever increases the hydrocarbon of the blood, as the *habitual* indulgence in alcoholic stimulants, and the imperfect removal of biliary matters from the system. Whatever impairs the freedom of the circulation in an organ, or injures its structure, tends to produce the fatty degeneration. Thus the granular and cacoplastic deposits in the interstices of the liver and kidneys, not being fully organised, and not receiving the renovating influence of the circulating blood, gradually degenerate into the fatty condition?

P.—Fatty transformation, then, being always a degradation, or descent in the scale of animality, the vital properties and physical condition of the affected organs must always be lowered thereby? Will you illustrate in what way function is thus impeded or perverted?

Dr.—For example, muscles thus degenerated lose their contractile power. An organ subject to distension, as the heart, becomes dilated, and may rupture. The tonic and elastic fibres of arteries suffer in like manner; they yield in pouches, or become lacerated; or eventually petrified. Glands and secreting structures lose much of their secretory activity; their cells, vessels, and ducts are obstructed or altered by their fatty contents. The solid viscera and interstitial textures become impaired in their softness, cohesion, and freedom of circulation, and become liable to further alteration and calcareous deposition.

CONVERSATION NINETY-SECOND.

Ossification—Healing of wounds with and without inflammation—Granular degeneration—Chronic disease and medicinal treatment.

DOCTOR.—WE shall now resume our discourse on structural degenerations. The *calcareous* or *osseous transformation* next comes under review.

PATIENT.—That is what we should call *petrifaction*, I suppose?

DR.—It is virtually so. It is a chemical process, the concretion of a calcareous salt, the phosphate of lime. Fatty degeneration approximates the animal to the vegetable; the calcareous approximates the animal to the mineral.

P.—What are the tissues liable to this change?

DR.—All those that are low in the scale of organisation, yet constantly moistened with blood-liquor, as cartilage, fibro-cartilage, fibrous tissues, and similar structures resulting from disease.

P.—Wherein does morbid ossification resemble the natural process?

DR.—Only in the deposition of the phosphate of lime in the interstices of the tissues. Ossified cartilages do resemble bone, because their structure approaches to that of bone. But in ossified fibrous tissues and membranes, as in the arteries and valves of the heart, the earthy matter forms layers and masses in no way akin to the structure of bone. Complete petrifaction is met with in the deposits of aplastic fibrine in the lymphatic glands, lungs, serous surfaces, and on and under the lining of arteries. If this escapes the fatty degeneration and softening it is ultimately converted into stony masses.

P.—Is there aught of this result to be attributed to a chemical affinity of the degenerated albumen for the floating phosphate of lime in the circulation?

DR.—This is uncertain. One thing, however, is clear, that the animal matter is absorbed and the earthy matter deposited.

P.—Ossification is chiefly a disease of old people, I believe?

DR.—It is; in such we find it often has been induced and hastened by chronic inflammation. The cartilages of their ribs and air tubes are more or less ossified. This change occurs earlier after repeated and prolonged chronic inflammation.

P.—I presume that in such cases the great injury to the part is their being rendered brittle and unelastic, rigid, and unextensible?

Dr.—Chiefly so. It is this which stiffens the gait, weakens the circulation, and in some measure produces the short breath of the aged; rendering their frames unfit to bear the shocks and changes they would easily resist if pliant and elastic.

P.—But such changes are also induced by disease?

Dr.—Truly; for example, the respiration and circulation are reduced to a factitious decrepitude in young people with asthmatic breath, or crippled circulation, or morbid digestive organs. With ossified bronchial tubes occur attacks of spasmodic asthma and pulmonary congestion. On ossified arteries or valves supervene *angina pectoris.*

From the subject of altered textures, I shall now pass, by an easy transition, to DEPOSITS *in or upon textures.* These consist in an excess of nutritive matters effused from the vessels over and above what the necessities of the waste and wear of the structure demands. Fibrine is the basis of all deposits.

P.—You have already described those resulting from inflammation?

Dr.—Yes; *but they often take place independently of inflammation,* being the simple overflow of the reparative materials of the body. Like the others, they are variously plastic or capable of organisation.

P.—I suppose we have the old subdivision *enplastic, cacoplastic,* and *aplastic?*

Dr.—It is as good as any other, and therefore need not be disturbed. We shall discuss them in their order. A healthy cicatrix is a specimen of an enplastic deposit.

P.—How is a breach of living parts, a cut or a wound, repaired?

Dr.—In one of three ways. First, by immediate *union* of the severed parts, lips, or walls of the wound. Second, by the effusion of *living cement,* or coagulable lymph, which becomes organised, forming a cicatrix or bond of union. *These occur independently of inflammation, and are better without.* In truth, inflammation interferes with the healing of wounds, which Macartney was the first clearly to demonstrate. Sir A. Cooper was quite in error when he said that the small wound from bleeding, could not heal without inflammation.* The third mode of healing takes place by

* "A Treatise on Inflammation." By James Macartney, M.D. Longman and Co.

granulations and lymph together—a process necessarily preceded by some inflammation.

P.—Wherein does the first process occur?

Dr.—In very small breaches of surface, in fine punctures and incisions, and in larger wounds where irritation and inflammation are *prevented*, and a moderate and equable pressure is exercised on the part.

P.—What best wards off this dreaded and disturbing inflammation and irritation?

Dr.—Soothing applications which remove the *sense of injury* and exclude the air—as the *water dressing* and the wet compresses of the water-doctor—the prototype of the water dressing. In this way no increased redness occurs, no swelling takes place, no obvious lymph is effused. As a result of the same protection, wounds heal when covered with a hard clot of blood.

P.—This mode of reparation, I suppose, is that of the normal formation and development of parts?

Dr.—Yes, it is the *modelling* process, as Macartney calls it; it is slow, but sure and perfect in result; and in performance it is unattended with pain, inflammation, or *constitutional* disturbance.

P.—We hear much among surgeons of the phrase, *union by the first intention*—what is that process?

Dr.—This is the second mode of healing of wounds, &c., we have specified. It is *not* the result of adhesive inflammation. The effusion of lymph for the reparation of tissues is not necessarily an inflammatory process.

P.—What does the microscope show relative to the healing process?

Dr.—In a cut part the vessels adjoining the wound are immediately obstructed by coagulable lymph. In a little while those adjoining them become enlarged, and receive an increased current. *It is this determination of blood towards vessels which are obstructed, which causes an increased transudation of the plasma of the blood.* This, perhaps, differs only in degree from inflammation. In depressed states of the system there is a deficiency of fibrine in the blood; at least the fibrine is deficient in organisability. A wound then has pale flabby edges, and will not heal until some degree of inflammation has commenced, calling on nature to *make an effort*, which increases both the amount and the organisability of the lymph.

P.—When lymph is effused between the two edges of a wound, or upon a closed internal surface, what happens?

Dr.—Its fibrine concretes or coagulates like blood; the serum is liberated and absorbed. The coagulum seen by the microscope at the beginning of the process, contains numerous cells (exudation corpuscles), like the colourless corpuscles of the blood. But the further details regarding the intimate acts of the regeneration of tissues are too minute to serve any practical purpose here.

P.—Well, then, what have you to say of *cacoplastic* and *aplastic deposits?*

Dr.—Wounds and ulcers may be repaired by degenerate effusions of lymph, that is, such as admit only a low or degraded organisation.

P.—I suppose that is the character of the scars formed on the healing of scrofulous sores?

Dr.—Precisely so. True skin, in the same way, is never regenerated; it is replaced by a tough, hard, opaque, white fibro-cellular structure, which constitutes the cicatrix. This, in extensive wounds, as in burns and scalds, is dense and thick, and tends to contract, which causes a puckering of the parts, and great distortion of the integuments. Similar deposits result from scrofulous and chronic inflammation of internal parts, and from congestion. The dense fibro-cellular and fibro-cartilaginous formations on serous and cellular membranes are composed of the same material. To the same class belong the indurated interstitial structure that characterises *cirrhosis*, granular degeneration of the liver and kidneys, old cicatrices and consolidations (contractile deposits), met with in the lungs; the opaque tough thickening of the valves of the heart, which is often attended with their corrugation, thickening, and rupture, and similar changes in the coats of the arteries. These deposits possess some degree of organisability. They are composed of irregular fibres and cells, filled up with more or less granular amorphous solid matter. Some are vascular and some are not. They are all much lower in the scale of vitality than the structures on which they are deposited. They are not of great extent in any organ.

P.—I suppose they are most met with in elderly people?

Dr.—They are, more especially those who have long suffered ill-health. These cacoplastic deposits of age and disease are illustrated in the opaque thickening of the membranes investing

the liver, spleen, lungs, heart, and brain; in the opaque patches in the lining membranes of the heart and arteries; in partial consolidation of the lungs; and in the granular appearance of depending portions of the liver and kidneys.

P.—The *law* is, I presume, that the more the nutrient function is perverted, the more degraded and abundant will be these morbid deposits?

Dr.—Quite so. Generally they are most abundant in one particular organ, more exposed or predisposed to suffer from the applied causes of disease. Alcoholic drinks injure the structure and function of the liver and kidneys, as well as the stomach.

P.—It is a very natural consequence, then, that when the corporeal energies fail from the inroads of age, or debility, or disease, the organs that have been *most tasked*, should become the subject of these degenerations.

Dr.—Those organs are the *kidneys* and *liver;* as the organs most abused by the dietetic and drinking habits of society. In these organs the circulation and secretion are often impeded before the other organs are much impaired. The one becomes the subject of *granular degeneration*, the other of *cirrhosis*, paving the way to fatal dropsy or jaundice.

P.—I suppose your modern Urinoscopists however easily they may detect it, can do little to remedy this state of the kidneys?

Dr.—Very little indeed. Their remedies are not calculated for that end. Drugs may and will irritate the kidneys, but cannot soothe or *heal* them. After all, however, it is addressing remedies to the wrong quarter. The kidneys are not the main spring or source of the evil. They are organs more sinned against than sinning in this morbid scene, and in the part they play in this dolorous history. I predict that the day will come when any *routine* treatment of chronic disease *by drugs*, will become obsolete. No well educated practitioner will be found to countenance a proceeding so vain and fruitless, so outrageous and unphysiological. It will be as much exploded *then*, as the drug treatment of the "*vital spirits in the arteries*" (which Harvey exorcised) is *now*. Even constipation is *not curable* by drugs; many patients, therefore, after repeated failures in the hands of the best London doctors, come here, and find how easily they are cured by *Dame Nature* and her faithful servant the *Water-Doctor*.

CONVERSATION NINETY-THIRD.

Morbid growths—Variety of tumours.

DOCTOR.—I WILL now say a few words about TUMOURS or MORBID GROWTHS, sufficient to give you a clear idea of their nature.

PATIENT.—These, I should imagine, from what you have already told me, are very clear cases of diseased nutrition?

DR.—They are so; parasitical structures, abnormal or supernatural, both in the kind and degree of their vitality. In elementary composition they resemble the natural textures, but in their origin and growth they are quite distinct. They are variously classed, divided, and subdivided, but practically their distinction into *simple* and *malignant* answers every end.

P.—What are the simple growths?

DR.—They are insulated tumours arising among natural structures, but not tending to implicate other parts, or to infect the system. They prove a source of inconvenience, or inflict the injury they do as a result of their size or position, or of the extent to which they uselessly appropriate the nourishment of other parts of the body.

To begin, ENCYSTED TUMOURS are the simplest of these abnormal formations. There are simple and compound *cysts*—the first are *serous*. They consist of a small bag of serum spontaneously developed in various parts of the body, of various size and shape, sometimes solitary, sometimes in clusters.

P.—Are not serous cysts due to abnormal enlargement of the primary or compound cells, of which you explained tissues to be partly composed?

DR.—Very likely they are. The development and compression of a series of cells sufficiently explains the production of solid complex growths. Cysts of the above nature are often found filled with unorganised contents of various sorts, constituting simple encysted tumours. *Hygroma*, contents serous, and when large forming encysted dropsy; *hæmatoma*, contents bloody; *steatoma* or

lipoma, contents fatty; *atheroma*, contents like putty or plaster. When such tumours form under the skin, they often contain epidermis scales, which render their fluids opaque and thick, or by agglutination they concrete into a horny fluid. In the vicinity of hairy parts they often contain hair. In cysts of the liver and ovaries cholesterine is found in abundance. In the ovaries are found cysts containing hair, teeth, and bones.

P.—Has inflammatory action any share in the development of these cysts?

Dr.—The textures adjacent to them are not necessarily disordered, but sometimes they are eventually disorganised by inflammation, or atrophied from pressure. When small, there are no symptoms to reveal their existence; when large, they dilate natural structures, or enlarge and obstruct cavities, as the calices and secretory ducts of the kidneys, or the Graafian vesicles.

P.—Now, please to give me some instances of these tumours.

Dr.—The enlarged *bursa mucosæ* in parts subjected to pressure, as the knees. Dilation of the mucous follicles in the cervix uteri. The cutaneous follicles distended with fatty or other matter (subcutaneous *adipona* and *melliceris*. The salivary ducts obstructed and filled with concretions, constituting the tumour called *ranula*.

The next class of tumours are the fibrous. They are composed of densely compacted fibres scantily supplied with blood-vessels. They are slow of growth and liable to ossify.

Vascular or erectile tumours (hæmatoma) are a knot of blood-vessels connected by areolar tissue. These may be florid or livid in hue, pulsating or not, according to the supply of blood.

P.—I suppose the pathological cause of all these, is abnormal cell-growth?

Dr.—You are right. They are the result of altered vital properties in the ultimate elements of tissues. Tumours, and especially the erectile kind—according to all analogy—form no exception to the mode of development of all structure, that is, from cysts or cells. One parent cyst developes a series of germs from its interior walls. These grow and fill the original cyst; other cysts are produced within the secondary cysts, and so on *ad infinitum*. The nature of their contents, and of the structures in which they arise, endlessly modify the appearance of these growths. In solid structures the cysts are compressed, and lose all their liquid contents. The walls of the cells, as well as of the adjoining textures, inflame and cohere, obliterating their sac-like

structure. The morbid cells in question are peculiar in their mode of growth. They are things apart, *sui generis*, unconformable, unassimilable to the structural arrangements of the adjoining living parts.

P.—That is, they are independent of the textures in which they arise?

Dr.—Yes; and at their expense. They approximate in character to malignant disease.

Hydatids or acephalocysts, are globular bags of a dense elastic albuminous matter. They stand on the confines of simple and malignant disease; maintaining a transition character. They are detached from the structures in which they arise, and have a low vitality of their own. Their power of self-nutrition is probably simple *endosmosis*. They secrete a clear limpid fluid, with a little albumen and gelatine in it, and this whatever be the nature of the materials in the midst of which they float. Hydatids do not belong to the animal kingdom, for they evince no response to stimuli, and have neither sensibility nor contractility.

P.—In the vegetable kingdom, therefore, they must rank with those primordial beings, the simple and minute vesicles you have described in our physiological conversations, constituting the *red snow* of the arctic regions.

Dr.—I do not see where else they are to be placed.

P.—Your cell-formation theory makes the origin of these neither doubtful nor far to seek.

Dr.—True. Abnormal cell development explains the whole perhaps of morbid products. Hydatids are mere effects of living structure, being detached from the solids of the body. In one sense there is nothing wonderful, and in another sense, there is much that is wonderful in the whole process. Each cell possesses a vitality in itself. Its power of endosmosis enables it to abstract from the surrounding medium the elements of its support. Hydatids reproduce by germules the young being developed between the layers of the parent cyst, and thrown off internally or externally according to species.

P.—Where are hydatids most commonly found?

Dr—In the liver, lungs, spleen, kidneys, ovaries. They have been found in the blood—in the pulmonary vein in one instance, but there was a large cyst full of hydatids in the liver of the same patient. They are usually held in a bag formed by the texture around them, or by the *débris* of collapsed hydatids.

P.—What are the symptoms produced by hydatids?

Dr.—Merely such as arise from their size and situation, that is, in so far as they compress, displace, and irritate organs, causing atrophy and inflammation.

P.—I may set them down fairly as occurring in connexion with cachexia and malnutrition?

Dr.—Assuredly. The ECHINOCOCCUS is a variety of hydatid, having a yellowish and tougher outer cell-wall, containing a distinct animal within it. It is found in the liver, spleen, mesentery, and in the substance of the heart, rarely in the urine. The CYSTICERCUS is another variety, found in muscular structure and in the aqueous humours of the eye. To its little sac-like body is appended a head furnished with suckers, and hook-like processes for attachment.

The DISTOMA HEPATICUM or liver fluke is rarely found in man. It is the cause of rot in sheep. It is found in those animals when dropsy is present, with a deficiency of albumen in their blood. It attacks those fed in wet clayey pastures. The subject of intestinal worms belongs to special pathology, and will be discussed in treating of specific diseases.

CONVERSATION NINETY-FOURTH.

Malignant growths—Scirrhous—Cancerous cells.

Doctor.—In the matter of general pathology, MALIGNANT GROWTHS are now all that remains for me to explain to you, to enable you to form a comprehensive idea of the human body. They arise in and pervade various textures of the body, either successively or simultaneously agglomerating into one morbid mass adjoining organs and textures. In this respect they contrast with simple, harmless tumours and deposits, *which push aside the natural textures, but never penetrate them.*

PATIENT.—Malignant growths, then, are distinct in character and tendencies?

DR.—Yes; they are not merely presently injurious, but ultimately fatal; from their size and situation, from the intractable ulcerations and fungous sores they give rise to, and from their noxious effects on the whole structure and functions of the body. Their degree of malignancy varies in different cases.

P.—Before we part I am anxious to have clear notions of CANCER.

DR.—This is a generic name that embraces the whole tribe of malignant growths. These are SCIRRHOUS; MAMMARY, PANCREATIC, LARDACIOUS and SOLANOID SARCOMA; ENCYPHALOID or MEDULLARY SARCOMA (FUNGOID HÆMATODES), and COLLOID or GELATINOUS CANCER. These are all varieties of one disease, and one in malignancy. They occur in the same subject simultaneously in different parts, or successively in the same parts.

P.—I suppose this the reason why patients so often die subsequently to the apparently successful operation for the removal of a scirrhous tumour externally, that is, one of the other forms of malignant disease appear in a vital interior organ, as the lungs or liver, &c.?

DR.—Precisely so; or the disease springs up anew in the place where it had been extirpated.

P.—That is because some roots had been left to germinate anew?

DR.—No; not so. The extirpation may have been perfect; but the essence of the disease consists in the tendency of the cells of that structure to push forth the morbid formations.

P.—To what are these varieties of malignant disease attributable?

DR.—To variations in the morbid materials, to different degrees of intensity or activity of the cancerous matter, and to the specific changes of the implicated textures induced thereby. *Scirrhous*, and perhaps *mammary* and *pancreatic sarcoma*, may be called *chronic cancer*. They are characterised by less tendency to active changes, to rapid local increase, or constitutional infection. The other forms may be called *acute cancer*, as pursuing a more rapid course in the parts first affected, and more speedily implicating other parts, or spreading a general infection.

P.—What is the minute or microscopic structure of cancerous matter?

Dr.—Nucleated cells and molecules imbedded in an areolar or fibrous web of varied degrees of density. In scirrhous and other more solid and chronic forms of cancer, the fibrous structure is more abundant, and is very perceptible to the naked eye, forming glistening striæ, or bands of cartilaginous hardness radiating through the mass. The cancerous cells and numerous granules are seen between these fibres, and accompany them as far as they reach. In cerebriform or medullary cancer, the nucleated cells are very numerous: the texture in which they are contained is areolar, and well supplied with vessels. This species grows most rapidly. From the extravasation of blood in the loose new textures a bloody appearance is given to parts of it, whence its other appellation *fungus hæmatodes.*

P.—You called *malignant* structures *parasites,* as luxuriating at the expense of other parts, or of the whole frame.

P.—They are so metaphorically, or literally in that sense. They are not parasites, however, if regarded in the sense of ova or seeds derived from without the body, which, being received into the body, and finding a proper nidus, or a congenial soil, there take root and develope distinct beings, like worms or hydatids, which draw their nourishment from the solids and fluids of the body. They do not so arise. Its germs are not so introduced. Cancerous growths, though clearly attached to, and intimately identified with the body, are yet distinct existences in one sense. Cancerous cells are often loose and unattached. They propagate themselves by the production of young cells within them. They thus take possession of a part, and extend their attachments through it, and afterwards disseminate themselves in remote parts, or infect the general system through the blood which in extensive forms of the disease contains cancerous masses.

P.—Is cancer contagious?

Dr.—I believe not. Its causes are from within, not from without. Malignant disease is only a much more intense degree of that perversion of the nutritive process which causes the more peculiar kinds of common growths.

P.—What produces this extraordinary alteration in the molecular nutrition of the affected parts?

Dr.—A local chronic irritation of some sort has much to do in starting the malady. But some undefined constitutional cause

or predisposition must concur with it. For example, the irritation of soot originates the *cancer scroti* of chimney-sweepers.

P.—I have heard of the tobacco-pipe producing cancer of the lips in inveterate smokers.

Dr.—Such cases do occur. Gastric or uterine irritation precedes cancer of the stomach or womb, a constitutional predisposition or taint always being understood to coincide. This alteration of nutrition is an ultimate pathological fact, which we cannot at present explain. Cancer cells are morbid modifications of the natural cell germs by which tissues are produced and nourished. The abnormal cells have a different sort of vitality and vital properties from the sound or normal texture cells. From such difference they derive their noxious nature and effects.

P—Who shall determine *the law* of that difference?

Dr.—Although the precise origin of malignant growths cannot be made clear to a *demonstration*, yet sufficient is known to reduce the matter *nearly* to certainty; at all events to support a very probable theory. Dr. Hodgkin supposes that they originate in cysts (not microscopic cells or cysts, but larger ones, which comprise these). The multiplication of these cysts within each other, their prolongation into radiated fibres, their pressure on adjoining textures, and other consequent inflammation, induration, ulceration, atrophy, or gangrene, comprehend the whole history of malignant growths. All that is wanting to establish this likely hypothesis is the *demonstration* of these supposed cysts. One would think that they ought to be visible at the commencement, or on the surface of cancerous growths, during their extension. There is a close parallel between malignant formations and the development on the body of entozoa from the cell-germs of natural structure.

P.—Are the variations of the disease explicable?

Dr.—Perhaps to a certain extent there are three morbid elements or modes of operation in malignant growths. First, the development of the cancerous structure in various forms and shades of intensity; second, their effect on the adjacent textures; third, the absorption of their cell germs into the blood, which form various tumours in lungs, liver, and other vascular parts; cancerous matter being often found in clots within the blood-vessels, or in the coagulable lymph effused by inflammation. The modification of these three elements determines the variations of the

disease. Scirrhus is the slowest form. It occurs above the age of forty. Structural nutrition is then a slow process; and the cancerous matter is of correspondingly slow development. It excites chronic inflammation in the adjoining textures, tending to induration, to contraction, to obliteration, more or less, of the natural structures. Hence the hard, knotty, corrugated swelling of the scirrhous mammæ, rectum, pylorus, &c., attended with more or less pain of a stinging or lancinating character.

P.—The functional disturbances must be to match with all this.

Dr.—For example. We have obstruction to the passage of food or fæces, severe dyspepsia, vomiting, &c. The continuance of irritation in an indurated part leads necessarily to ulceration; (open cancer) with ragged, inverted, or everted edges, and a fungous or sloughing interior, discharging a dark, offensive, ichorous matter.

P.—How are cancerous ulcerations so intractable to remedies?

Dr.—They are not, by their very nature, likely to heal, unless a great amelioration of the constitution takes place. Its walls being composed of the cancerous structure, and the compressed remains of the natural textures, the wherewithal for cure fails. The natural outlets for natural lymph, if there were any to spare in the system, are too much dried up: its secretions are too poor, too scanty, too perverted, to afford lymph of sufficient plasticity for a cicatrix.

P.—Does the ulceration prove an outlet for the increasing cancerous matter?

Dr.—No; it only the sooner taints the system. In the scirrhous stage the indurated mass is no doubt a protection to the economy for a long time. It acts as a barrier between the cancerous germs and the healthy texture. This being broken down, what is to prevent the ichorous matter of the morbid structure from being deported into the circulation and poisoning the system? In fact, the disease at this stage exercises a profoundly disorganising influence on the whole frame, extreme wasting not merely of the bulk of the organs, but of their composition. The bones become brittle from the loss of animal matter; the membranes thin; the lungs light in weight and colour; the whole textures bloodless, as shown during life by the extreme pallor or sickly sallow hue of the patient.

P.—Does cancer prevail in old age?

Dr.—Occasionally; but then its course is much slower. It is

a disease rather characteristic of the decline of life. From forty to fifty is its prevailing time. The activity of textural nutrition has a large share in the increase and dissemination of cancerous disease. For this reason a scirrhous, or even open cancer of the breast, which would be rapid in its progress at forty-five, will between sixty and seventy remain stationary for years, and hardly shorten life.

P.—What are the characteristics of the other forms of cancer?

Dr.—The pancreatic, mammary, lardacious (pork-like), solanoid (potatoe-like) varieties are intermediate between the scirrhous and encephaloid disease. They approach the former in firmness, but grow with greater rapidity, and are attended with less pain, from the less tension and induration in the implicated textures. They are therefore less disposed to ulcerate and slough. When they prove fatal, they kill by encroaching on a vital organ, or by sowing cancerous deposits in other parts.

Encephaloid (brain-like) or medullary sarcoma is acute cancer, and is of rapid growth. It occurs chiefly in the young and middle-aged, and has its seat in the most vascular tissues. The speedy increase and early dissemination of this variety of cancer is attributable to the vascular activity of the part in which it lies, and the abnormal plastic process then and there elicited. The mass of an encephaloid tumour comprises false membranes, lymphatics, even coagula of blood in various degrees of organisation.

P.—In such a rank soil, I should suppose, the cancerous cells and fibres luxuriate and increase, like mushrooms in manure?

Dr.—Perfectly true. Even the coagula in the veins in the neighbourhood of such tumours exhibit the encephaloid appearance: so also the coagulable lymph produced by inflammation of the serous membranes, or the parenchymata of organs. The rapidly destructive character of this species of cancer is attributable to the rapid dissemination of cancerous matter, and to the unwieldy, unabsorbable, yet highly vascular lump of deposit which it induces around it. This fatally penetrates, compresses, and obstructs the organs. The vessels of these tumours are varicose, and freely communicate with the arteries adjacent. This, together with the general softness and looseness of their texture, explains how hæmorrhage so readily occurs into their substance. Hence this kind of cancer has been named *fungus hæmatodes*. It generally kills before great emaciation takes place.

P.—What is the colloid or gelatinous cancer?

Dr—(The areolar of Cruveilhier.) It may almost be called the germinal principle of cancer—isolated or concentrated cancerous matter, unmixed with the natural tissues, or their nutritive or secretory products. It consists of cells, larger and rounder than usual, contained in a very slight loose web. No distinct growths are formed. It is an infiltration of gelatinous matter into the weft and woof of the texture. It is met with chiefly in connexion with advanced stages of other forms of cancerous disease.

Other varieties of cancer are described. But they are needlessly minute distinctions, modifications of cancerous growths, probably derived in a great measure from the peculiar structure of the parts in which they appear, or the extent and rapidity of their development.

I shall conclude this branch of our conversations with a reference to a peculiar disease which occurs in combination with cancerous tumours, namely, MELANOSIS—BLACK CANCER, or BLACK TUBERCLE (Cruveilhier and Carswell). It commonly presents the form of a loose areolar tissue, filled with a peculiar black matter, suspended in a serous liquid. Sometimes its substance is quite compact, and resembles crude yellow tubercle, or lardacious cancer. It is compared to the black pigment of the eye; and is considered by Andral to be identical with the colouring matter found in the lungs and bronchial glands. This is a carbonaceous powder contained in the interstices of the textures, and sometimes in the vessels of the lungs and bronchial glands. It is doubtful whether melanosis be entitled to be classed with malignant growths.

P.—Does it proceed from the colouring matter of the blood?

Dr.—This is altogether doubting ground. Some alteration of the blood lies at the root of it. Here then, for the present, I must close our exposition of the *principles* of general pathology. The VARIOUS MODES OF DYING may perhaps next interest you. To this subject I may devote a conversation. Adieu, nous verrons.

PART VI.

THE WATER-CURE PROCESSES;

OR,

THE SYSTEMATIC APPLIANCES AND PRACTICAL DETAILS OF THE WATER-CURE.

WITH

AN ATTEMPT TO EXPLAIN THE TRUE THEORY OF THE MODE IN WHICH THEY ACT ON THE HUMAN BODY;

AND

TO LAY DOWN RULES FOR THEIR SAFE AND SCIENTIFIC ADMINISTRATION.

CONVERSATION NINETY-FIFTH.

The water-cure theory, and the actual science of the day—How does it cure?—Medicinal adjuncts—What is polypharmacy?—Candid medical opinion.

PATIENT.—MY dear Doctor, if I am to judge of the sentiments of others from my own, I believe that the first and anxious inquiry that interests and agitates every intelligent patient on subjecting himself, or proposing to subject himself, to the water-cure, is *How does it cure? What is the rationale of its operations?* How are explained those surprising changes from disease to health, which it effects, not only in the course of a few months, but often in a few weeks, *in chronic cases* long intractable to drug-medication; and *in acute cases*, as I am informed, in the course of a few days, or even of a few hours?

DOCTOR.—It is an object infinitely desirable both for the practitioner and the patient to have clear ideas of the nature and ends,

and the action and application of, the water processes. This is a subject on which much mystification still exists. Yet, I apprehend, when once ascertained, nothing can be more plain, more level to common sense, or more in accordance with the first principles of chemistry, physiology, pathology, and therapeutics. From all that science has revealed to us of the ultimate and intimate nature of diseased action, the *Water-Doctor* may boldly, yet modestly and truthfully affirm of his system of treatment, that it can be proved *to a demonstration* to be the most rational and successful *method of healing, taking it as a* WHOLE, of any curative agency ever yet propounded.

P.—So saying, you admit, or imply, that there are *rational* prescriptions in the drug system?

DR.—I do make that admission most unhesitatingly. Who should know if I do not, that there are valuable resources for the sick in the stores and experience of drug-medical practice—and even in homœopathy. I would, of course, except the *glaring imposture and humbug*, that taint some valuable discoveries that characterise the latter. But, after a fair investigation and trial of both old and new physic, I most conscientiously believe my own system far the most effective, because, while it is free to adopt all the best lights and aids of its compeers, it deals with an agency which in *nine* cases in *ten* enables us to dispense with the subsidiary aid of medicine in any dose, and when that becomes necessary it both *facilitates its action* and augments its efficacy. But on this branch of our subject I shall give you my experience at a future period. In the meantime to the subject in hand.

P.—Your declarations are very strong, and show at least what your convictions are. Some may construe them as enthusiastic or high-flown—I am sure at all events they are honest and heartfelt.

DR.—Knowing what I know of the water-cure, studying it as I have studied it, and seeing what I have seen and experienced of its capabilities and actual performances, I say, on my conscience, *I speak not beyond bounds.* I utter only the words of truth and soberness.

P.—I understand you to say *that hydropathy, as a theory, lays its foundations deep in the actual science of the day; and that, as a practice, its means and appliances best bring about those changes in the body which the nature of morbid action points out to be done, in order to the restoration of healthy action?*

DR.—That is the substance of my affirmation and belief. More-

over, the water-cure, whether considered as a theory, or as a practice, challenges the severest tests and scrutiny that can be applied to any curative system. Will any other stand so fearlessly forward to be examined?

The proud position of the Water-Doctor is that of a *physiological* practitioner—the strong basis of his hydropathic science and art is *physiology*. Pathology and therapeutics are all derivable from that, and each inseparably linked with the other. The first shows the *standard* of the corporeal constitution in its solids and fluids. The second marks the *deviations in structure and function* induced by disease; and the third traces *the methods of recovery*. But as we started from physiology to learn what disease is, so we are brought back to physiology to learn how to cure disease. For the path that nature follows in her sanative efforts, the agency she works with, the aids she requires, the *laws* she conforms to, and the rules she acts by, constitute the true and only basis of an effective medicine, or healing art. By this line of studies, alone directed and corrected by actual observation, and treatment of the disease, shall the profession be able to shake off the prejudices and the trammels of polypharmacy, and become alive to its *scientific errors*, as well as its *practical evils*.

P.—What is *polypharmacy?*

Dr.—That complex, cumbrous, unwieldy, *dangerous*, and *uncertain* system of giving and mixing all sorts of injurious drugs. Excessive faith in "nostrums" and specifics, which has existed more or less from the days of Galen and the Arabian physicians down to our own time, to the neglect of that acute observation of nature's instincts, leadings, and tendencies, and the disuse of those simple precautions and domestic remedies, that in the *beginning* of so many diseases are adequate to afford the organism all the help it needs, a course of action, that with the physicians of the earlier times of the world proved more abundantly successful, than modern *chemical doctors* can possibly believe.

P.—I should presume that a meddlesome interference with nature, as for example, strong and oft-repeated dosings, bleedings, salivations, *forced* drains from the bowels, kidneys, or liver, has in very many cases only the effect of thwarting nature's efforts, deviating her ways, subverting her powers, and rendering the system the more easy prey of the destroyer—disease. I believe, doctor, if you were to ask any candid physician of your acquaintance, he would say that my remarks were true, particularly if you applied

the question in reference to the *drug practice* he had *witnessed* in all other hands but his own.

DR.—Such is virtually the conclusion and dictum of some of the leading spirits, past and present, of our profession. If the opinion be somewhat *ultra* in its tone, there is this good in it, that it plainly indicates the expediency of a return to those sane and simple principles of treatment embodied in the philosophic and physiologic—or, if you like, hygienic—WATER-CURE.

P.—Well, the world will in due time do you this justice, that you are anxious to practise with the sanction of the patient's understanding, if that patient will only be at the pains to follow your counsels, to study what the body is in health, and what its condition and requirements are in disease. No cause can be more straightforward than this certainly. You attempt no mystery or mystification with regard to any part of the processes. All is plain and above board, and your hate of humbug is gratified.

DR.—In fact, I hope and believe, we water-doctors desire nothing so much as to have patients of cool, deliberate judgment; and the more generally intelligent the patient is, and the better informed he is, especially on all medical topics, so much the better for us. Hence my best patients have often been *retired* medical men—acute, learned, and experienced—men mature in judgment and in years, men sufficiently clear-sighted to see the errors and inefficiency of the old system of the *drug treatment* of chronic disease, and too independent and too honest not to *hail* an *ally* of the *healing art*, come in what guise, under what name, from what quarter, it might.

P.—This alone argues much for your cause, that you can dispense with exacting any *blind* confidence in yourself or your measures, that you can render a valid reason for the whole of your treatment, and for every part of any ordinance or operation you may advise. You can afford to set your light so that men may look at it. It is only stolid ignorance, timid doubt, crafty deception, or the thorough humbug, that courts darkness. Knowledge, honesty, frank purpose, and open practice, ask only to be brought to the light, that they may be seen, known, and in due time, approved of all men.

CONVERSATION NINETY-SIXTH.

First principles—The nervous and circulating system—Quality, quantity, and distribution of the blood—Preissnitz and the water-cure system.

PATIENT.—I BELIEVE it was the practical lights struck out by an immense variety of experiments on the action of water on the diseased organism, and not on any *à priori* reasonings, that have created the hydropathic processes the splendid implements of the healing art that they have become.

DOCTOR.—It is true, to a certain extent. But Preissnitz told me that his theories, however defective, preceded his seeking for remedies and finding them. However that may be, like some others of the greatest boons to mankind, many of the valued instruments of our art were neither the suggestions of theory, nor the elaborations of the closet, but the pure discoveries of experiment.

Let me caution you, however, on the subject of the argument drawn from *cures*. Everybody knows that the water treatment produces astounding results—cures, I believe, never before paralleled; for a great many of them take place in patients alleged incurable. But cures, *although an immense recommendation*, and this on the principle of judging of the tree by its fruits, are not always a safe criterion to judge by. For some systems of stunning humbug and arrant imposture, rest their pretensions on the same grounds, grounds open to much fallacy. But if the *Water-Doctor's* great success *in practice* can be explained on the soundest grounds *of theory*, then the curative results I boast of are not to be laid to the score of blind hap-hazard, or simple good fortune; but, on the contrary, *are results obtained in accordance with* LAW—a success that may be calculated to attend all *similar* cases *similarly* treated.

P.—LAW—I like that word. I do not mean parchment law, vexing, cheating, low cruel men's, rascally pettifogging law—but the Creator's divine physiological LAW. I apprehend and appreciate the high ground on which you wish to rest the merits of the water-cure.

DR.—This is the *sole* ground on which the scientific water practitioner bases the pretensions of his system. *It is by the*

scientific soundness, or unsoundness of the water-cure, that he must stand or fall.

P.—Well. Now for the *rationale* of the processes.

Dr.—For this I wish to lay a broad and firm foundation in your understanding, and in the understanding of every water patient. To this end it may be necessary to refresh your memory with a brief summary of some of the points illustrative of the nature of disease, its facts and doctines.

If I am to vindicate myself, as not a vain boaster—if I am to justify *all* the laudations of the advocates of hydropathy—that it is a system in minute and curious accordance with the teachings of the exactest medical science; a system based on the very constitution of man's frame; a system taught and enforced by every fact of anatomy and physiology, pathology and chemistry; a system at once harmonising with the philosophy and reason of things, and justifying its *abstract* pretensions by *practical* proofs without number and without parallel—then I must proceed to *prove* all this. I ask you to take nothing for granted. Your credulity or love of the marvellous is not called upon; I do not ask you to believe improbabilities or impossibilities.

To show the special grounds of the details and operations of the water-cure, we must again have some brief and cursory talk about *first principles.* It is necessary particularly to refresh your memory, as to the fundamental conditions of the diseased body; then we shall be prepared to comprehend those deductions from the *nature of disease*, which show the general theory and scientific basis of a true healing art. These may occupy a conversation or two, but the time and attention will not be lost, although it be going over old ground. I hope and expect it will neither be uninteresting or unedifying. For if I am to explain and make you understand the true idea of *remedy*, it is requisite to recapitulate some of our long discussed points of pathology, and refresh your memory with a summary of the most material and palpable conditions of *disease*, and of the generalities of diseased action.

P.—I recollect that you stated that the fundamental fact and condition of all diseased action was this, *an undue activity, accumulation, or stagnation of the circulation in the capillaries of the affected structures.*

Dr.—Precisely so. Apart from this tangible pathological state or result of disease, we know nothing very accurate of what disease

is, or wherein it consists. We talk much, indeed, of *nervous lesion;* but it is an *unseizable element* for the most part. We can rarely make it clear to our senses, as we do in the more palpable vascular changes.

P.—Nevertheless you asserted that this nervous damage, impairment, or injury of the great vital electrical battery and wires (for to this you likened the brain, spinal chord, and ganglionic system, with their nervous ramifications *everywhere*), was the *first link* in the chain of morbid sequences.

Dr.—Yes, truly, and that we know for certain, and on many grounds. The nervous system, especially the ganglionic, is the *primam mobile* of all healthy action—the part of man's wondrous mechanism first generated, and the last to die—the part on which the practitioner most surely calculates to aid him in his efforts to arrest or cure disease; the part which, least strained, or exhausted by hard work, or hard living (good or bad), is a valuable criterion by which the experienced practitioner judges of the amount of hope there is for a patient, and of the degree of success likely to attend curative efforts.

P.—With such views of the nervous system, nobody can accuse you of not appreciating its power or its importance, or of assigning to it only a secondary place as an agent of cure.

Dr.—Quite the contrary. Yet you cannot too distinctly remember, that we can only efficaciously address the nervous through the circulating system. In no other way, save by electricity, or the direct impartation of the nervous energy of one individual to another, can *abiding* healthful results be established in the nervous system, or in any other part of man's frame, except as I have before mentioned. The circulating system, I repeat, is the great field to cultivate, granted by nature and pointed out by science for the operations of the Water-Doctor. His great function is to rectify the *quality*, the *quantity*, and the *distribution*, of its currents.

P.—You say then, that the circulating system is that on which the operations of the Water-Doctor tell most in producing curative organic changes?

Dr.—Yes, I do; the system he is specially called on, or which is specially "indicated," in the treatment of disease to be modified, and the system which he has most directly under his command. In fact, if you asked me to define briefly, yet accurately, and

philosophically, what was the great function of the medical practitioner, I would say in a word, it was to rectify the *quality*, the *quantity*, and the *distribution* of the blood. And thus add fresh energy to the nerves and vitality to the body.

P.—It would seem, then, by all the fresh lights which modern chemistry has thrown upon this subject, and by all the sanctions lent by modern science to the water-cure, that providence had opened up this field to man as a new curative possession.

Dr.—Certainly all that we know *now* of the chemistry of the blood, urges the practitioner *more than ever before*, to explore its untold sources of healing, and to try its neglected power; to use it more and more as the recipient and channel of healthful influences to every other part of the economy. And just in proportion to the genius, judgment, and energy with which this field is cultivated, will the art of healing arise from the ruins of the false props it has so long leaned on.

P.—So far as my reflections go on medical practice, and from the light you now place the matter in, I should say there has been *much oblivion and neglect of the circulating system.* Else how could every means have been so sedulously and systematically taken to poison or to vitiate its currents—at one time to gorge them with excess of blood—at another time to drain it off like so much water—all which I consider is brought about by the introduction into the system of irritating materials—materials totally foreign to the composition of the structures; by "stimulating" diet and "strengthening" drinks, and by the too often reckless withdrawal of the essence of the body's strength and life, the blood—*the alone source of its repair.* And all this, forsooth, as has often been alleged, to enable it the better to struggle against the assaults of disease.

Dr.—What other result could you have expected from so great a perversion of the true ends of healing, of so outrageous a divergence from the common-sense path of corporeal renovation, a path clearly pointed out to the student of nature; and *now* a path equally clearly traced by the lights of science.

P.—A new and better system was therefore loudly called for, by every motive at least of humanity, if not by the march of modern progress.

Dr.—And here is a fact too that contains weighty matter for reflection: that when *such a system* was struck out in the *solitudes of Silesia*, how singular to find it in curious and minute accordance with the teachings of the exactest science of the day; to find

it, when carefully bottomed and analysed, a system based on the very constitution of man's frame; and *now* taught and enforced by every fact of ANATOMY and PHYSIOLOGY, PATHOLOGY and CHEMISTRY; a system at once harmonising with the philosophy and reason of things, and justifying its *abstract* pretensions, by *practical* proofs without number and without parallel. And this system we owe to the creative genius of Vincent Preissnitz, and the *providential circumstances* by which he was surrounded.

P.—Bless my life! I am glad to hear you say as much; I was beginning to think, that being so occupied with nervous centres—ganglionic and animal—capillaries, and chemico-vital changes, actions, reactions, and counteractions—your *fons malorum*, *vis medicatrix*, and *modus operandi*—you had quite forgotten what you owe to *him*. One was almost led to imagine that Preissnitz had stood meekly by, admiring the building up of the water-cure, as it rose step by step into a perfect system—and then went his way rejoicing, when he saw it delivered to a grateful people, fresh formed by the creative genius, and fostered by the cheering influence, of medical orthodoxy. I am truly glad that you *are assured* of the *fact*, that neither Dutch nor German, English nor Scotch doctor, neither surgeon-doctor, nor apothecary-doctor, homœopathic or *soi-disant*-doctor, had anything to do with it—except in the way of an *active opposing cause*.

DR.—All you say is very true; but calm your virtuous ire, I have not been ungrateful as you suppose. I am rejoiced to find myself no longer treating my cases of *chronic disease* with drugs, which I suppose I should be still doing, with the rest of the water-doctors, but for the enlightenment we owe to PREISSNITZ's *water-cure* system. Medical men have also done a heavy and profitable day's work in their generation, which I could make clear to you were this the place. Not alone in the aid they have afforded to the progress of science and civilization—in attending the sick, and administering consolation in the hour of need—but also in their devotion and courage. The latter, we know, is an attribute of the human being, and reaches its highest pitch in a fight, where there is firing away, or cutting and slashing, with blood flowing and cannon roaring; but there is courage of a higher order, which enables men calmly—without the pomp or circumstance of murderous war—to pass their days in an *infected* and *deadly atmosphere*, affording relief and meditating remedies, where hundreds are dying of plague, cholera, yellow or typhus fever. Who will deny the immense debt that humanity owes to the medical profession?

In judging of those who are gone, we should remember, that every generation has the *advantage* of the scaffolding raised by its predecessor. We should thus avoid an injustice often committed, by blaming *those of the past*, for their errors and short-comings. The last lend their best lights and props, with their accumulated capital, to those that start afresh. But with all this, we find DAME NATURE granting lights to a German farmer to create a CURATIVE SYSTEM, which centuries of SCIENCE had denied to the combined fraternity of *all* the sons of Esculapius.

CONVERSATION NINETY-SEVENTH.

End and aim of the Art of Healing—The simple physiologic cure based on imperishable truth.

DOCTOR.—HAVING refreshed your memory in our last conversation with some of the fundamental facts concerning the nature of diseased action, it still remains necessary, before I endeavour to explain the mode in which the *processes act*, to lay before you a few deductions from the nature of disease, which plainly show what is the *general theory* or *scientific basis* of a true ART OF HEALING, by whatever name it may be called. These I will mention in the shape of a few plain observations, which even the common sense of every unprofessional man must assent to. No consequences from any facts, it appears to me, can be clearer in themselves, or more reasonable in their applications, than are the following remarks.

The end and aim of the healing art, in all its forms and schools, dogmatic, empiric, eclectic, allopathic, homœopathic, hydropathic, the beginning and the end of the medical man's calling (by whatever name he may be called, or whatever agency he may use), is to amend the quality of the blood and to direct its distribution. The surest means to promote the former object is that which most successfully accomplishes the latter.

PATIENT.—You showed certainly very plainly, in your last conversation, that in deranged, diverted, or locked-up currents of blood, however produced, lie the source and essence of all diseases.

Dr.—True. This embarrassed and irregular circulation in itself is bad enough, but the worst part of it is, the inevitable tendency and result of such a state of matters, which is, to vitiate the quality of the fluids, and to impair the energy of the solids. For it is too clear, to need a moment's insisting on, that, to what extent the usual vital or chemical decompositions in a part are perverted or prevented, to that extent the sound constitution of the blood is lost, and it becomes more or less charged with excrementitious matters. In any case, it is less fit to sustain the healthy functions of life. The structure itself falls into disorder, and its solids and fluids are malelaborated. The nervous, the circulatory, and the secretory systems, and all the energies they subserve, then flag and fail. In short, man's fabric has lost the conditions of health and becomes diseased.

The character and intensity of all diseases are determined by the varying degrees of this derangement of blood-currents and impairment of blood qualities. Upon the exact appreciation of the extent to which one and the other of these states exists in any individual case, is the scientific method of treatment based. In this is often demonstrated the genius of the practitioner, and by this suggested the means of his success.

P.—If I remember well, I think this was one of your great pathological doctrines, that this faulty circulation and character of blood—its excess and obstruction in certain organs, and its deficiency in others—according to its local extent, and the constitutional infection or structural impairment supervening or superinduced, produces the morbid states called *irritation*, *inflammation*, *congestion*, *engorgement*, *induration*, *ramollissement*, or softening, and other organic alterations.

Dr.—You are quite right. This leads me to another remark.

That the resolution of these sanguineous accumulations, the correction of these irregularities, the equable distribution of the vital current throughout all the interior organs, and over all the exterior surfaces of the body; and, consequently, the restoration of healthy properties to the blood, healthy structure to the tissues, and healthy action to the frame generally, can only normally and effectually be brought about by an agency exclusively directed to exalt the physiological and healthy play of the organic functions.

P.—The question then becomes, "What is the best agency of cure?—where is it to be derived from, from the resources of the mineral or the vegetable kingdoms?

DR.—From neither. You will recollect how I proved before, in our *introductory* conversations, that the bane involves the antidote, that remedy is placed side by side with disease, that it consists in imparting the *right direction* to the *deviated powers* of nature. This brings me to another remark.

That the CURE *of disease is to be sought in the powers of the living organism, and not in the vain nostrums of the apothecary's art. This is a sound principle, universally received by* all *philosophical medical men. But as there is no general rule without exceptions, I gladly take the opportunity here again to remind you, who are* ultra *in your dislike of all drugs, that many cases occur wherein drug medication, judiciously used, renders signal help to struggling nature.*

P.—I should like to know what you consider is the *extent* of this *help;* and in what directions best rendered? I have seen little else than mischief—making bad worse—by drugging. In this opinion I am backed by many justly celebrated physicians, and I can give you chapter and verse, if you like it.

DR.—The grounds for *my* opinion, I shall at a future time define and explain to you. In the meantime allow me to state, that if cure be solely and exclusively the result of the body's own efforts, a very clear consequence resulting therefrom is,—

That the most available agents of cure are those required for the healthy exercise of the natural functions, especially those of waste and repair, of excretion and secretion.

P.—I suppose, in our present state of knowledge, no other agents can minister health to disordered functions?

DR.—It is not likely, so far as the ordinary LAWS of nature operate. But to proceed. It is another equally clear consequence flowing from the above admitted fact or premiss,—

That the true, safe, and scientific art of healing *must consist in this natural agency reduced to a system; the real* hygienic system, *the* simple physiologic cure; *its* modus operandi *exactly understood, and its technical rules established on sound principles; in a word, its practical applications and its scientific bases clear, tangible, and definite.*

P.—Well, I anticipate your conclusion from your conclusions; that the *ensemble* you call the *water-cure* is the natural agency thus methodised?

DR.—I cannot see how that conclusion can be parried.

P.—I must say, according to all your reasonings, that the *water-cure* comes the nearest of any other system to the philosophic

beau ideal of a curative art or science. It has much to allege in justification of this high pretension. It lays its foundations deep in the soundest principles of physical science—that is saying much for it.

DR.—I cordially believe with you, and am prepared to prove that the abstract merits of the water-cure, not to speak of its practical capabilities and results, are far higher than those of any other system. Believe me, the water-cure is not the chimera of an hour, or the folly or fashion of a day. Based on imperishable TRUTH, and fitted to confer the most solid advantages on society, it will, as a system of curing disease, as well as a system for *preserving health* and *prolonging life*, command the acceptation of *all* who calmly investigate its merits, as it will secure the confidence of all who fairly test its powers.

CONVERSATION NINETY-EIGHTH.

Reasonableness of water-cure remedies—True theory of action—Water, air, exercise, diet, and repose—Capillaries and chemico-vital changes—Inflammation and congestion—Fever.

PATIENT.—THE *general* scientific basis of the water-cure, as you have explained it in the preceding conversations, I believe, I am beginning now to understand. The deductions from admitted principles, as applied to the *abstract* question of cure, appears to me sound and unexceptionable, and carry with them the full assent of my understanding. I trust, therefore, all this preliminary ground being cleared, that I am now prepared to enter more deeply with you into the *feasibility* and *reasonableness* of the water-cure remedies. I am anxious to know the special grounds, principles, and details of each individual operation, its specific local mode of action, and the general constitutional changes it effects.

DOCTOR.—The true *rationale* of the water-cure processes is a question of far more moment, than appears to the superficial observer. Clear views of their agency are now of considerable consequence, both to practitioner and patient; not only becaue

without a rational and consistent theory of action, we are constantly liable to err in their application, but also because the determination of their real action will constitute a fair field of discussion whereon to decide what medical practice, *as a whole*, has the best claim, *in pure reason*, to the largest confidence and the most permanent popularity.

I hope to make it clear to you that there is nothing mysterious in the operation of the water-cure "means and appliances." The mystery, if there were any, would be, that they did *not* accomplish the great *curative* results which medical *reasoning* and *theory* alone would lead us to anticipate. You will, therefore, lend me your ears, while I attempt to unfold the high rationality and efficiency of the *simple water-cure processes*, and to establish *on indisputable physical facts* what I believe to be the true theory of the mode in which they produce their effects.

P.—I shall be glad to give you my undivided attention, that I may understand the physiological principles on which the multiform water processes operate. Indeed a faithful portraiture, a scientific exposition, of their distinctive attributes and actions is now a *sine quâ non*—it is, as it were, *to take a likeness of the Water Spirit—to daguerreotype the genius of Hydropathy.*

Dr.—If (following your figure and humouring your *comparison*) I fail accurately to portray the shape and lineaments of this spirit or being, to embody its essence, and to transfer its features, it is not so much from want of light, as the want of skill to put it in the true position for that light. The characteristics to be taken stand out so clear and defined, that, if the image be incorrect, or the picture blurred, the fault is not in the light, or the object it shines on, but in the maladroitness of the draughtsman. It is not from a paucity of *material*, but an *embarras de richesses.*

P.—Well, to arrive at the explanation of the potency of the water-cure.

Dr.—To obtain that desired result, it must not be viewed in *its totality*, in the aggregate and combined result of its agency, but *in detail*, and in the operation of its individual parts, each piece of the mechanism, as it were, being taken asunder, and examined for itself intrinsically, as well as explained *in its relations to the whole.*

P.—That is the advisable plan; the only true way of treating the subject. For it stands to sense, that an accurate appreciation

of the combined effect of the whole agency can be obtained only from a through comprehension of the individual parts.

Dr.—Quite so. Without going to the bottom, therefore, of this subject, and analysing the action of each element of the CURE, without ascertaining clearly the effect of each *process*, of *diet*, *air*, *exercise*, *repose*, *regimen*, &c., my elucidation of the principles and practice of the water-cure would neither be as complete or comprehensive as would satisfy you.

Here, then, *in limine* of this exposition, I must further refresh your memory with a brief recapitulation of physiological doctrines relating to the subjects of *capillary circulation*, *cutaneous action*, and *the production and dissipation of animal heat.* These lie at the foundation of the *water-cure as a science*, and by affording the most intelligent and intelligible *rationale* of its action, constitute the safest guides of the judgment in its practice *as an art.*

P.—Without a proper theory of the action of his remedies, I should presume the practitioner will be often mystified by his own measures, will be liable either to underrate or overrate the organic capabilities to bear prescribed treatment, and will go perhaps blundering on, accomplishing cures by mere haphazard?

Dr.—Undoubtedly, one would naturally expect that in the non-comprehension of the real theory of the water operations lies the greatest source of errors of treatment, of failures where cure was practicable or within easy reach. At the same time I should remark that I have seen excellent treatment and excellent cures, the result of fine natural tact, combined with much experience and close observation, *without theory* or any medical knowledge; and, on the other hand, I have seen very fine theorisers do considerable mischief to water-patients, from want of this natural or acquired tact and experience; I have seen others err from never trying or feeling the effects, on their own persons, of the remedies they so freely administer to others.

To refresh your memory, I must request you to note again that the *capillary vessels*, or the minute ultimate branches of the circulation, and the *ganglionic system of nerves* are the chosen instruments, seats, centres, and sources of all the *chemico-vital processes* of the organism. In them repair and waste, secretion and excretion, the building up of the new materials, and the taking down of the wasted fabrics of the body are carried on. Of these changes the blood is at once the *medium* and the *stimulus*, and the nervous system is the *operating power.*

P.—An electro-magnetic agency, it is presumable, acting along the wires, the nerves?

Dr.—Heaven knows! it may be so. However, recollect there is no *extra vascular* action in the body; I mean no *vital* action out of, or independent of, *vessels*. In the interior of the capillaries the blood is brought into contact with the net-work of organic nerves which ramify in them, is pressed against their points, and the absorbing orifices. In this, nature's secretest laboratory, her *sanctuary* I might almost call it, the *composition* and *form* of the various structures of the body are determined.

P.—Are the capillaries passive carriers of fluids, or have they an independent peristaltic action of their own, in consequence of which they propel forward their contents?

Dr.—While I admit that the principal cause of the motion of the fluids in the minute vessels is referrible to the chemico-vital changes that take place at their extremities, as, for example, in secreting organs, on exhalant surfaces, as those of the skin, lungs, peritoneum, &c.; nevertheless, it must be conceded that the capillaries are very much influenced by the nature of their contents, or by mechanical irritation acting on them from within or from without. They contract or dilate, become turgescent, or flaccid, according as the blood may be too stimulating, or not stimulating enough. Dietetic irritants or medicinal poisons, for example, ardent spirit, opium, foxglove, prussic acid, &c., at first unduly excite their coats, and then, exhausting their irritability slacken or paralyse their action, according to the intensity of the exciting cause. On the other hand, when the contents of the capillaries are not exciting enough, in states of the blood deficient in red particles, and excessive in serum (anæmia), in scurvy, &c., or from the effects of poulticing, or long soaking, or macerating the capillary tunics, and the areolar tissue in which they are embedded, the *tone* of the capillaries is impaired, their tension relaxed, their irritability diminished, and their contractile power weakened.

P.—Are not all these you last describe precisely the physiological actions wanted to reduce irritation or inflammation in a part, or to effect the cure of chronic disease?

Dr.—Precisely, and note this effect of maceration. It is to be remarked that in such case, *the capillaries are nearly empty, and completely so of all red fluids.* This is the condition of the skin after the action of a poultice, heating compress, or wet-sheet packing, and, to a certain extent, after warm

and hot fomentations, long continued. Surgically, this would be called *one effect of the water-dressing.* The part is rendered pale, shrunk, flaccid; in short, *it is depleted*—one effect of blood-letting, leeching, and cupping, has been accomplished *without loss of blood.* Moreover, not only has the cutaneous surface been emptied, but such is the effect of this process by sympathy on the deep-lying organs below, that a similar disgorgement has been operated on their overloaded capillary circulation. In whatever way this is brought about (call it *organic sympathy* or any other term) it is an undoubted fact. In consequence of the same sort of action, by sympathy or consent of parts, *leeches applied to the epigastrium, or hypochondrium, unload congestions of the stomach and liver.*

P.—That gives me some light on the action and utility of the abdominal compress, which is prescribed to be worn in many cases of digestive derangement?

Dr.—It is; and you have in part its *rationale.*

P.—Well, such being the effect of imbibition, maceration, or poulticing the sentient surface or the sound skin, I can easily conceive its effect in diminishing the painful distension of an inflamed part.

Dr.—To be sure. In an inflamed part the action of the capillaries is morbidly increased, their organic excitability (or irritability) is too tending to exhaustion, to relaxation. This, in fact, constitutes the distinction between *inflammation* and *congestion.*

P.—Will you please refresh my memory again with those distinctions?

Dr.—With pleasure. The doctrine is "in a nut-shell." The one is an *active* the other a *passive* state. In *inflammation* the blood is propelled too rapidly and forcibly, the contractility of the vessels is too great, their movements excessive, their irritability and sensibility are morbid. Very probably, too, in an inflamed part such an alteration takes place in the blood (from the altered nervous power of the part) as renders it unnaturally stimulant.

Congestion is the opposite of all this. It is the relaxed, exhausted state into which has fallen an over-worked or over-excited part. The blood accumulates and *stagnates* in it, because the propelling energy of the vessels is lost. Hence compression of the adjacent structures and more or less solidification of their substance is the result.

P.—But this is not all the evil, according to your own showing.

For the contained blood, no longer undergoing the due chemico-vital changes, must become not only morbid in itself, but also a source of morbid excitation and empoisonment, at least to the neighbouring parts, if not to the rest of the system.

Dr.—You perfectly comprehend the matter. Hence, I need hardly tell you, we have in this way, *when peculiar constitutional predispositions exist*, malignant alterations of structure of various kinds developed in the seats of neglected, or maltreated chronic inflammation, or more strictly speaking, chronic congestions.

P.—Well, as you are upon these topics, will you step from inflammation to *fever?*

Dr.—You have only to depict to yourself the *active* condition first described as *existing on a large scale, extending over the whole body, pervading the entire blood-vessel system*, and you have a representation of *fever*. In the latter case (in fever) there is besides a general and central impairment of nervous power, a dynamic fault, or organic lesion, at the *core* of man's vitality, which is the first link in the chain of morbid action, and the main-spring of the diseased sequences. In plague, typhus, yellow fever, malignant scarlet fever, or cholera, this is the part on which the destructive blight first falls, or first *tells*. From this starting point the seeds of death are dispersed over all the rest of the frame. The next link in the chain in fevers and inflammations (simple or malignant) is a morbid irritability (inordinate action) of the heart and blood-vessels. But this is of very short duration in cases where the offending cause is still more fierce, as in cholera. The action of the vessels in some cases is paralysed, almost suspended, from the first circulation is arrested. Matters cannot long remain at this pass. Reaction must ensue, or life is soon ended.

P.—Well. To turn to *practical* account all this sound doctrine, now for its applications. If such be the state of things the practitioner has to contend with in disease, local or general, acute or chronic, what is the remedy by which this state is to be opposed?

Dr.—If we had a means that could control *at once*, and restore the perverted or exhausted nervous power (which is at the centre and source of morbid action) all the tedious round-about processes of the water-cure, or any other cure, would be superseded. For some *few* cases such a power exists, whether it be in the electric force of *faith* in the patient, or a mysterious mental influence, or corporeal galvanism. But we must be content to attack disease in the nearest of its strongholds to which we can have access—that

is, the deranged capillary circulation; and by the means proved the most feasible, sensible, and scientific for accomplishing the desired ends.

P.—This brings us again to your grand doctrine, that *the circulating system, as influenced by the nervous system, is the great field for curative operations*, a field opened directly, as it were, by the hand of nature, and pointed to be cultivated by every light of science.

Dr.—We have yet a discussion or two on the subject of the skin and of animal heat, and then I shall have the ground fully prepared to show you *how* the water-cure accomplishes the ends just pointed out (the regulation of the capillary circulation), how *safely* as well as how *effectually* it does it?

CONVERSATION NINETY-NINTH.

The skin—Cutaneous action, direct and indirect—The power of repeating curative operations—The skin an organ of elimination, and not of nutrition.

Doctor.—The skin is one of the greatest excreting organs, in fact, is the principal *outlet* of the body. It may be denominated a web of nerves and blood-vessels. Endowed with exquisite sensibilities in itself, it acts immediately on the centres of sensation, the brain and spinal chord. But it has also intimate sympathies with the interior organs, by means of its filaments of organic or ganglionic nerves, in consequence of which it transmits to the vital parts within all morbid impressions made on the surface; and whereby in turn the cutaneous functions themselves become deranged by every *interior* irritation. According to the extent and intensity of the interior derangement, or visceral disorder is the healthy action of the skin perverted, and does it become reciprocally a source of aggravation to the interior suffering.

Patient.—The skin and mucous membranes, I think, you described as nearly identical structures, and analogous or equivalent in function?

Dr.—They are. The skin may be considered a mucous membrane *with its epithelium dried*, that is, its delicate outer membrane in the state of a simple tiling or pavement of scales. In the usual condition of the skin, its hardened insensible covering, the epidermis, cuticle, or scarf-skin, is nearly water-proof. Each of its minute scales forms a valve to give exit to fluids, but to repel, or nearly so, the passage in of fluids from without. *By soaking, however, this coating is made permeable.* It then acts like any other porous matter, that is, by capillary attraction. When this outer barrier is once cleared, fluids are readily absorbed from the true skin (the same as from mucous membranes), by *endosmose*, or interstitial absorption.

P.—What is the effect on the vascular system of cutaneous action, as roused by the hydropathic processes?

Dr.—This is two-fold, *direct* and *indirect*. In the first place, the abstracting of heat from the surface of the body determines a rush of blood thither to supply its place, thereby unloading interior congestions and tending to establish the sanguineous equilibrium; the gain of fluids on the exterior of the body being obtained by the relief or unloading of the interior—a result too palpable to require a moment's demonstration. In this lies half of the cure. For to relieve the labouring viscera of the stagnation, or of their excess of blood, to restore the lost equilibrium of the intropelled fluids, and *allay irritation*, in most diseases, acute and chronic, is the principal help nature requires, and should be the one great aim of medical art to accomplish. This done successfully, the organism soon rights itself. It only wants the pressure on its springs removed. Then the nervous (vital) power is liberated, and in a state to put forth all its energies. All that is necessary is to supply gradually (as the demand for them arises) the *natural* stimuli and supporters of vitality. To meet this requirement, the hygienic *regimen* of the water-cure has been created, THE WHOLE SYSTEM OF DIET, DRINK, AIR, EXERCISE, REPOSE, MENTAL AND CORPOREAL HABITS.

P.—So much for the *direct* effects of cutaneous action on the vascular system. What is the *indirect* effect?

Dr.—This is that which is propagated by the route of the nerves, and is of two kinds: first, *excitant*, or what is generally understood by the term stimulus or shock; second, sedative, soothing, or the effect we attribute to a poultice. In the first of these cases, the cerebro-spinal and the ganglionic nerves have a tem-

porary excess of vitality given them by the stimulus of the cold-water. The heart and blood-vessels simultaneously participate in the recruited energy and beat with augmented power and steadiness. Hence congested viscera are found to be relieved, and finally disgorged by the *repetitions* of the process, under fitting circumstances. The cheering and genial stimulus of the *entire nervous system* goes for a great deal, in the curative agency of the chilled or cold bath; in all cases of pure debility, or simple under-par action of the corporeal powers, *precaution being always taken to ensure reaction.* On the other hand, the soothing of the nervous system, and the *reduction of vascular excitement*, by the refreshing and poulticing processes of the cure (the sheet-packing, the fomentations, the compresses) and the *warm-bath cooled down*, are some of the modes of relief in diseases of above-par action of the body.

The combined use of these two principal remedies of the water-cure, the means of graduated stimulation, and the means of *sedation* respectively, their *artistic* handling, according to the phases of corporeal excitement or depression, constitutes the routine of ordinary water-cure practice. Let me impress upon you again the immense importance of the fact that we can *repeat* our curative measures daily, without which *many chronic diseases* would be hopelessly incurable.

P.—The aim of your observations, and the conclusion of your argument is, to *show* that the *skin*, or as you call it, the great external sentient surface, is the best seat or field for *active* and *repeated curative operations*, when the body is diseased; and this you make out as warranted on the strictest grounds of medical philosophy and science.

Dr.—Assuredly. Every fact in physiology and pathology lends its support to this grand therapeutic principle. And truly it is sad to repeat again, that the alimentary tube and its exquisite nervous lining should be used *exceptionally*, and with *merciful* consideration, by all who know the dire consequences of its abuse, either by irritating drugs or other means. The stomach and bowels should, as much as possible, be reserved for their natural purposes, the repairs of the body, by sound digestion, and pure blood making.

The skin, I contend, is pre-eminently fitted, and indicated to be the chief battle ground of the practitioner in his struggle with disease, and this, for a variety of reasons. First, as being a great

medium for transmitting impressions to the brain and spinal chord, on the one hand; and to the viscera of the chest and abdomen on the other. Secondly, as being a sort of electric surface, with infinite connecting wires, the conducting media along which power is to be sent to either of its extremities. Thirdly, as being an organ of *elimination* and not of *nutrition;* one of only secondary and not primary consequence to life. Fourthly, from the *immense superfices* covered by the skin; from its thrilling sensibilities, and *extensive sympathies;* by its influence over the circulation by *graduated cooling*, &c., and from being at the same time the part most patent to observation.

CONVERSATION C.

Animal heat—Effects of abstracting and accumulating heat—Derivative action.

DOCTOR.—I HAVE now come to the last of those expositions preliminary to the discussion of the water-cure processes themselves, expositions necessary, although repetitions, because they go to unfold in a great measure the secret of their mode of acting. I therefore request your attention while I reproduce a few of the salient points of the physiology of animal heat.

The primary, indispensable condition of the life and health of animals is a due amount of animal heat.

A small diminution from, or increase above, the healthy standard, if persistent, entails serious, often fatal, derangement of the organism.

As the body, even under the greatest cold, hardly varies from the temperature of 96°, it is plain that the quantity of heat generated must precisely correspond with that abstracted; in other words, the generation of heat in man bears an inverse proportion to the temperature of the air.

The sources of heat in the body are similar to those which support combustion out of the body, that is, heat is liberated in both cases by the union of oxygen with carbon and hydrogen.

The only means by which heat is brought to, or developed in, any part of the body, is by circulation of the blood. If the body were a solid lump of metal, the cooling of one part, say a limb, while other parts were withdrawn from the cooling influence, would cool that part unequally; but being a sort of living sponge, or hydraulic machine, its fluids going to and fro and ever in motion, the temperature is constantly equalised by the warm blood conveyed to the part. This is independent of the chemico-vital changes which are effected with increased energy in the cooled part.

The elements whose union yield heat, are supplied in the food, in the air inspired, in the water drunk, and from the wasted, decomposed, and absorbed fabrics of the body.

In proportion as heat is abstracted from any part, and, consequently, more heat developed in that part, *more materials of heat must be supplied;* a more active circulation also must be established in the part; more blood must be determined to it; more energetic chemical decompositions must take place; *a greater change of structure must there be brought about*, the breaking up and absorption of the old, decayed, or diseased matter, and the deposition of new. In short, an augmented activity of the *vis vitæ* must prevail in the parts systematically cooled, an exaltation altogether of that *physiological activity of function*, which the practitioner can alone count upon as the corrector of morbid action.

To effect these purposes the Water-Doctor applies water *methodically*, not only *directly* (or as near as possible) to the principal seat of disease; but indirectly to remote or unaffected organs; that is, on the principle of *revulsion* or *counter-irritation*, with a view to operate there such determination of blood and such activity of chemico-vital changes, as shall tend to unlock and draw away the pent-up stores of the diseased structure, in order to supply the large demand of vital fluid set up in the locality chosen for active curative effort.

This, then, may be established as a well made out point of the water-cure theory and practice—*that the abstraction of heat from a part*, or *its exposure to cold, produces a determination of blood to that part.* Here, then, we reach a *main fact* of the water-cure *modus operandi*, which has not yet been properly regarded, insisted on, and shown in its important bearings. LIEBIG, indeed, had shown the effect of applied cold in hastening the change of matter in the body; and this, writers have taken advantage of in their *rationale* of the processes. But here their view seemed to rest. To my talented friend, Mr. Julius Jeffreys,* belongs the merit of having first rightly seen and developed the important practical conclusions this fact (the effect of abstracted heat) suggests.

It is necessary accurately to distinguish, on the one hand, between the *primary* or *temporary*, and the *secondary* or *enduring* effects of *the abstraction of heat* from the body; and, on the other hand, to study well the effects of *the retention of heat by covering up* with non-conductors, as compresses, blankets, &c. In these distinctions are involved the solution of the whole problem of the water-cure, the *rationale* of its processes, the grand secret of that great curative system, whose daily and *ordinary* results in restoring to health, can be shown far to outvie that of any other medical system known.

The *primary, intrinsic*, and *essential* effect of the abstraction of heat is *sedative*, a lessening of vital action, or the reduction of excitement. It tends to exhaust the sensibility and irritability of the structures by the excessive demand and drain upon them for the time being. The result is, the fluids are repelled from the surface, and retreat to the interior. They have only to be followed there—to life's citadels—by prolonging and intensifying the cold, to extinguish life altogether. Used, therefore, with a curative view, in the hands of the Water-Doctor, this effect is permitted only to be very *temporary*, or if prolonged, so graduated *as to be followed by a more normal condition* and *slower* reaction.

The *secondary* and *enduring* effect of the abstraction of heat (when confined to moderate limits, as in the daily water-cure ope-

* "Views upon the Statics of the Human Chest, Animal Heat, and Determination of Blood to the Head." London: Longman and Co. 1843.

rations), is *stimulant*, an augmentation of organic action, of the *sensibility* and *irritability* of the vital structures. *The necessity of replacing the lost heat calls the blood vigorously to the exposed surface, and augments the capillary actions thereof*, requiring every vessel, and every particle of blood, to be in full activity, doing duty. These phenomena are more vaguely expressed by saying the vital powers react, and send the repelled blood back to the surface. This is the fact. The stimulus of the cold applied in such cases by the temporary *toning up* or *tension* of the nervous system they produce, is an element that cannot be left out here. The refreshing feelings and electric thrill thus sent through the system summons up all the energies of the ganglionic system and of the heart, however languid but an instant before. This is an instinct of the economy summoning it to meet the call on its powers, and make an effort. Hence, between the augmented impulses of the heart and vessels, and the intensified chemical actions taking place on the surface invaded by the cold, there is wherewithal instantly got up for stout resistance. The whole science and skill of the Water-Doctor consist in taking due advantage of these conservative efforts of nature.

The *primary* effect of the covering up of a part, the prevention of the escape of its heat (or, what is equivalent, the *proper application of heat*), is to determine and retain the blood in the part covered up. But this effect is only for a comparatively brief and definite time. If this covering be continued and prolonged, or become the habitual state of the part, then the primary effect gives place to one entirely opposite. The *secondary* and *enduring* effect, therefore, of the retention of heat *is to diminish the activity of the circulation in the covered part.* The daily facts that attest this effect are too common to need comment. Those persons who *muffle up most*, or live in hot rooms, are the *chilliest subjects.* The capillary circulation of their surface is almost null. Little demand for heat is there set up, and there is, therefore, but a scanty elaboration. The capillaries are idle, and might be empty. The *paleness* of the *covered up* parts of the body, and the *redness* of the *exposed* parts, indicate in the one case the *defective*, and in the other case the excessive circulation that is going on on the surface. On a frosty day, the air is abstracting immense quantities of caloric from the exposed face. The excessive capillary activity, the rapid change of corporeal particles, at the expense of which

the heat is there *still* kept up to the standard of the body, is sufficiently shown in the rubicund face, more especially if such a person comes into a warm room, or sits down before a fire, then the blazing of his countenance attracts all notice; for now there is no cold to draw off the rapidly evolving heat, its outgoing is stopped, and *this effect continues till the capillary activity subsides.*

These facts have very important practical applications to be developed, more particularly in treating of the respective processes of the water-cure.

The whole *rationale* of the water-cure processes resolves itself simply into these two elements:—First, *the effects of heat abstracted from the body by cooling it in various ways and degrees.* Secondly, *the effects of the accumulation of the* HEAT *of the body by covering up with non-conductors, or by its direct application from without.*

A derivative action towards the skin, therefore, which can only take place by a change in the interior organs (by the relief of congested viscera), is one great aim sought by every process of the water-cure.

The same is the aim, or should be, of the practitioner of every school, but an aim very inadequately accomplished, and very generally quite counteracted by the masses of drug-remedies in which those who have had *most experience* of them, possess *least faith.* Nevertheless, I repeat again, they contain valuable resources for occasional use in many interesting cases even during the progress of water-cure treatment; but particularly where hydropathy is not admissible, or where the time for its application has passed away.

CONVERSATION CI.

Rapid change of structure—Reaction—Derivation and revulsion—Stimulation and revulsion.

PATIENT.—THE scientific views you have just explained seem to me sound and unexceptional, as well as clear in their application to the matter in hand. They violate no dictate of my common sense. On the contrary, they carry with them the full sanctions of my reason, and the more especially as you have divested the subject of all technicalities.

I am now prepared, I trust, to hear with profit and understanding your elucidation of the details and instruments of water-cure practice, their specific local action, and the general constitutional changes they operate. On these points I am anxious for special information, as well as to have some precise *rules* laid down for the safe and effective administration of the water remedies.

DOCTOR.—The science of the water processes, as you will perceive, is narrowed to the smallest point.

As disease is *one* essentially in its ultimate nature and material conditions, so the water-cure is specifically *one* remedy — the various processes are but so many modifications of one appliance —of one grand curative agency. This is the true light in which the water-cure must be viewed.

The efficacy of the water-cure processes, or indeed of any external appliance of water *below the temperature of the body* is comprised, as you will now understand well, in a threefold action: the abstraction of heat, its rapid reproduction, and the active determination of blood to the chilled surface, and the intensified or quickened chemical vital changes thereupon ensuing, by which a uniform temperature in all parts of the body is kept up. The entire series of these actions operate a powerful *revulsion* (or determination of fluids) to the surface from the deeper seated parts and remoter organs.

P.—By this, then, clearly appears the scientific suitability of the water-cure as the natural remedy of diseased action, seeing that the characteristic condition of disease, chronic or acute, is congestion or abnormal vascular accumulation in the affected struc-

tures or viscera. No logical consequence, I think, can be clearer than that.

Dr.—True, most unquestionably. The reasonable and clear idea and definition of the water-cure processes is, that *they are graduated and systematic modes of abstracting, accumulating, or adding to the heat of the body so as to operate reaction, derivation, or determination of the blood to any amount, in any given direction or locality.*

The benefits of this derivative action or revulsion are, first, the production of great activity of the capillary circulation of the surface of the body from the interior, and by its relief, thereby equalising the flow of blood throughout the body, transferring it from tissues where it is *plus* to tissues where it is *minus;* in this way operating the disgorgement of those visceral obstructions that lie at the foundation of all disease, and thus improving the *nutrition.* In the second place, by the promotion of a more rapid and perfect change of matter, whereby diseased structure is *disintegrated,* abnormal particles, fluids, and secretions removed, and new tissues of *healthier materials* substituted, and thus, bit by bit, the whole corporeal fabric is renovated and rebuilt. This is effected by the quickening of the chemico-vital function of the capillaries in order to liberate heat, to generate tissues, and to compensate those abstracted. Liebig says that in water-curing the body is nearly re-made.

Put the thing in this light, and you will at once have an adequate idea of the immense abstraction and reproduction of caloric that often takes place in a water-cure process. A patient will remain in the shallow-bath or in a sitz-bath, *without materially diminishing the heat of his body,* for a length of time that would have sufficed to cool down to the centre a solid metal statue red hot.

P.—That is a clear view of the matter. By the laws of physics both should have parted with equal amounts of caloric to the surrounding media, and that the living body made up what it lost in this way, is the strongest proof of the activity of the vital processes that must have been called forth to sustain this compensating action.

Dr.—I think now you sufficiently grasp the leading feature and characteristic action of the water-cure processes.

P.—Yes, I hope so. Their *derivative effect* is the great action of the hydropathic operations. In this way *they are artistic modes*

of cooling and heating the body to obtain certain specific ends; the change of tissues from diseased to healthy; the dispersion of abnormal accumulations of blood in organs, and especially the permanent increase of the circulation and functions of the surface of the body, the best guarantee for the soundness of the interior.

DR.—You have it; place it, therefore, where your memory will retain it. Never forget that the object of many of these processes *in theory*, and their actual effect *in practice*, is the vigorous determination of blood to the surface of the body, to the relief of loaded parts (visceral irritation) within. The oftener the body will safely endure this operation, the speedier will be the reduction of disease. The skill and acumen of the practitioner consists precisely in determining this point, and what *modifications* of the processes will best effect it.

P.—I believe I quite understand that too. For as you have so often shown, as it is the body alone that must right itself when deranged, *its capabilities must necessarily be the limit and measure of your curative efforts?*

DR.—You judge the matter accurately. The perfection of the water-cure administration, for example, in chronic disease, lies in this, *so* regulating the *dose* of the treatment, as that REACTION shall be ensured *invariably*, and therefore the risk and abuse of cold bathing avoided. In the power of adapting the water-cure appliances to all degrees and kinds of corporeal stamina, lies its availability for most cases and for every constitution. The degree of abstraction of heat is suited to each individual's capability of replacing that heat. The weak have a weak dose, and as their strength increases so does the amount of their treatment. The lowness of the reactive powers, the slowness with which heat is reproduced, is, *cæteris paribus*, a measure of the extent to which the body is maladive, and of the intensity of the visceral congestions in any given case. Of course, the water-cure procedure to be prudent, safe, and effective, must be in many cases by very gradual steps. The scientific practitioner, gifted with tact and quick perception, finds better means than excessive medication, which he avoids.

P.—I suppose, then, that the test of corporeal stamina and endurance is to be found in the manner in which the body responds to the abstraction of heat?

DR—It is a valuable test.

P.—But what are the conditions necessary to the safe abstraction of heat?

Dr.—It may be laid down as the fundamental rule for REACTION *that the circulation on the surface of the body be augmented before* or *at the time* the abstraction of heat is effected, *if in any way called for*. With this view various modes are resorted to. First, the accumulation of the bodily heat by wrapping up in non-conductors as blankets, to the point of sweating or short of it. By *packing in the wet sheet*, which we shall presently see operates a gentle gradual abstraction of heat from the body; for the sheet always remains five or six degrees below the animal temperature. The efforts of the system to make up this abstraction of heat necessarily create an *additional* movement of the fluids towards the surface of the body. By the wet *sheet rubbing*, which powerfully tends to augment the cutaneous circulation at the very moment that heat is being abstracted. An active state of the superficial circulation is effected by means of the lamp-bath, by the vapour-bath, and simply by the warm-bath. Lastly, the same result is obtained by active exercise, or by the bath attendant applying friction. In any of these ways corporeal heat is accumulated or augmented, if necessary, before the patient is submitted to a process that abstracts it. All this, I speak with reference to *chronic disease*, and simply by way of general illustration of our practical principles and procedure, which in our next conversation I shall enter on without further preface. In the meantime, as we are upon preliminaries, I shall settle any more general points you may have to propose before concluding the present conversation.

P.—Well, having obtained *reaction*, by the scientific abstraction of heat, how do you maintain it?

Dr.—That is a point of infinite consequence. It is best maintained by active exercise for some time afterwards. When that is not possible, then cover well up in bed, or keep in a warm room, and let the servant apply rubbing freely.

P.—What do you make of the distinction of the processes into sedative and stimulant?

Dr.—Whether they are to be sedative or stimulant in their action depends on the dose, time, and mode of any given process. Any arrangement, therefore, founded on their innately sedative or stimulant action is fallacious, because each is in itself either sedative or stimulant according as its administration is managed.

The essential, and most important action of every water-cure process is *derivative* or *revulsive*, that is, the determination of the fluids from the interior to the surface, from the centre to the ex-

tremities. Bear this fundamental principle always in your mind —*a moderate* and *temporary* derivation is *stimulant;* an *excessive* and *prolonged* derivation is *sedative.* Of course these states are relative to the *constitutional capabilities,* and the latter must ever be the guide of the practitioner, and the *measure* of his *dose,* in administering his remedies. That which would be powerfully sedative to a weakly person, would be strongly stimulant to a robust frame.

P.—These explanations now place for the first time the whole reasonableness of the hydropathic processes in a clear point of view to my mind. In conclusion, what do you say of the shock produced by the sudden contact of cold water with the surface of the body? what element does that constitute in the curative results accomplished by the hydropathic processes?

Dr.—The production of the stimulus of *shock,* as you understand the word, is not by any means a necessary element in the water-cure, although it is often desirable.

Shock is a strong excitation of the nervous centres, animal and organic, propagated from the nervous extremities. Of course, it is only admissible in a potent form, in cases where those nervous centres are free from structural alterations, for any active functional excitement. At the same time remember that there are modifications of *shock* from sprinkling the face to the shower-bath, plunge, and douche-bath.

P.—Thanks; enough for one day's conversation. You have given me materials of thought for some time to come. Now that I am clearly indoctrinated in the general mode of action of the processes, the details of each individually will have peculiar interest.

THE SHALLOW-BATH.

CONVERSATION CII.

Refreshing and invigorating—Tonic—Its power, convenience, and facility to dose and regulate—The warm or tepid bath cooled down—Rubbing in the bath.

DOCTOR.—ON the processional method which teaches us to ascend through the *simple* to the *complex*, I shall begin with the familiar wash-down, or ablution, in the shallow-bath, or half-bath; the mildest, easiest, best, and most convenient of general bathing operations. Yet is it a powerful modifier of the condition of the skin. Seated in this bath, with the legs extended, or sitting like a Turk, the patient is well washed and rubbed by the bath attendant, and assists himself. It is the most useful bath in the water-cure as a general ablution. It has the advantage of being *at the bedside*, and being made to answer, with buckets, all the purposes of a plunge bath, if necessary, without any of the risk and inconvenience that frequently, and in many cases, attends the latter.

PATIENT.—This is clearly *tonic* and *refreshing*, and may be made a strongly stimulant or sedative process.

DR.—It is usually *made* to be *tonic* and *refreshing*, as you mention; because the abstraction of heat, although great, is but temporary; thereby insuring vigorous reaction, and a rush of blood (as before explained, and as you now well comprehend), to compensate the effects of the chill, and to make up the caloric abstracted, by augmented circulation and quickened chemical actions. The shallow-bath is strongly stimulant by reason of the vivid thrilling impression made on the immense vasculo-nervous web of the skin, all trembling now with vitality and sensitiveness, however dull or dead but an instant before.

The shallow or half-bath I might designate as the initiatory process for every patient, as well as the complement and finish of nearly every other hydropathic appliance.

P.—But do you not think it an objection to this process, that from the position of the patient it unduly cools the feet, legs, and hips?

DR.—On the contrary, in the majority of cases, in that derivative action on the lower and remoter parts of the body, at the

expense of the higher and the central parts, supplying blood thus from where it is in excess, to where it is in defect, in the general tendency to recal and fix blood on the surface; in this equalising of the circulation, in short, lies *one* of the peculiar advantages and efficacy of the shallow-bath.

P.—I stand corrected. I had not reflected on putting my question. The application of the principle you have laid down throws out now to my mind, in strong relief, the action of the bath. The increased abstraction of heat from the submerged parts gives them an advantage, and determines thither an increased impulse and activity of the circulation to replace the heat abstracted.

Dr.—Just so, by the strong revulsion and flow of the fluids towards the surface and extremities, all the grand vital viscera, the brain, the lungs, the heart, the stomach and its complex connected apparatus, the uterus and its annexes, &c., are solicited to give up any superfluous blood they hold, and to make an effort to change their morbid and defective action.

P.—And as a sort of stagnation or congestive condition of one or other of these organs, as you have explained, exists as a predominant characteristic in most diseases, whether chronic or acute, I infer how great, indeed I *should* say how *general*, must be the applicability of so powerful a revulsive agent, and one, in good hands, so safe to wield, so *easy to dose and regulate.*

Dr.—Moreover, the active determination towards so large a portion of the surface and extremities is not instantaneous or transient, but continues for long after the patient has left the bath, and is further promoted by the friction with the sheet and towels in drying, and by the active exercise that follows. There is also a remote and maintained reaction, as well as an immediate transient reaction, which I shall have occasion shortly to explain to you.

P.—I plainly perceive that in the way you describe, all possibility of chill is prevented. I should suppose such a bath to be very excellent for a healthy person to take regularly on getting out of bed in the morning.

Dr.—It is first rate. I know nothing equal to it; and I enjoin it and the walk on all my patients, on leaving me, as one of the means of retaining undiminished the regained blessing of health.

P.—In what cases do you especially prescribe the shallow-bath?

Dr.—It is almost universal usage after the packing and the sweating processes. After both operations it constringes and braces the relaxed fibres and capillaries of the soaked skin; it

rouses the pulse, somewhat depressed by the wet sheet; it cools the body, lowers the pulse, and quiets the excitement produced by the lamp or vapour-bath, or blanket packing. In either case, it is *a potent refresher and equaliser of the circulation*, enhancing and confirming the derivative influence and the obvious flow of fluids to the surface, produced by the antecedent operations.

These measures have only to be *repeated appropriately* day after day, ultimately to effect an entire and permanent disgorgement of interior congestions; to restore, therefore, functions imperfectly performed from defect of blood on the one hand, or from too much blood on the other.

P.—It is now to me the plainest thing possible, how, by these means, congestion of the viscera is relieved, and the circulation throughout the body equalised—so precisely, even curiously, fitted are the means to the end, and so simple withal, and so within the reach of everybody almost at a few minutes' notice. I now perceive why you have so often repeated, and laid so much stress on the *fact* of your being able to REPEAT your water-cure remedies, more or less modified, *for any length of time*. I now understand how the chronic inflammation of the mucous membrane of the stomach and congestion of the liver, which my physician in London told me I had, were *not cured*. I remember my good doctor, who attended me with as much care and attention as if I had been his only son, told me he dared not give me any more blue pill, calomel, or alteratives in any shape—that I could not bear tonics, and that the six leeches applied once a week must be discontinued; that, in short, I must go at once to a warm sea-side place, and trust to nature. I did so, and was no better. His last solemn and repeated injunction was, "to keep away from doctors, and take no more medicine, as I valued my life." The latter injunction I have religiously obeyed, as you know, and, thanks to a *very gentle course of water-cure treatment* I am so well, that I should have forgotten all about medicines and mucous membranes, digestive organs or diseased livers, but for your kind confabulations. I see clearly how the innocent and simple water-cure processes, relieve irritation and congestion of the viscera, and how they equalise the circulation throughout the body. It is, indeed, a wonder to me that the "FACULTY" are so *backward* to *practise* and *inquire* into your methods, which are, as you prove, in exact accordance with every dictate of physiology, pathology, and sound therapeutics.

Dr.—I know what you mean. There are obvious reasons why our profession should be slow, as a body, to adopt innovations, and to abandon old *routines* of practice. But this I shall not discuss here. In dilating on the *peculiarities* of my own profession, it would most probably lead to my directing your attention to those of *other professions* also. I might ask your private opinion of the cheating and vexing processes inflicted in a Christian country on poor mortals, by ordinary law proceedings, or call your attention to the fœtid, inhuman, or I should rather say godless perversions and abuses of *Chancery* and the *Churches*, that exist in full force in the nineteenth century of Christianity. I think our profession would come out the more *strong* and *radiant*, the more you persisted in trying its merits or demerits by such odorous comparisons. I hope that will suffice you for the present.

P.—Quite so, I shall ask no more questions on that head. Well, to our text. As the intensity of all diseases, you have said, is in relation to the extent and duration of this sanguineous excess in internal structures, I suppose that the length of cure will be entirely proportioned to the time it takes to operate their disgorgement; and I should also infer the difficulty of cure to be precisely in the ratio of the *fixity* of the blood in the affected tissues, and of the *alterations of structure* thereby and therein produced.

Dr.—It is precisely so. Your premises and your conclusion are both perfectly correct.

P.—Is the use of the shallow-bath materially modified by the sweating process, as compared with the wet-sheet packing?

Dr—It is. The patient, as a general rule, may remain in it longer, for the reason that he both needs, and can bear, more cooling. In this way, reaction, or the sanguineous flow to the surface, is more actively promoted, visceral congestions solved, morbid secretions and retained morbid materials eliminated, the nervous centres strengthened, and the general circulation more permanently equalised.

P.—I think I have heard it said, that appropriate rubbing in the shallow-bath, tepid, chilled, or cold, in cases of severe accidents, shocks, and apoplexies, in the collapse of cholera, often recovers those apparently dead or dying.

Dr.—It does. It is invaluable. But then it is used after a different mode. This is a most important remedial measure, which I will explain to you apart elsewhere.

P.—What regulations do you propose regarding the use of the shallow-bath?

Dr.—These are few, brief, and simple, it being understood that the shallow or half-bath is the standard process that concludes all operations of packing and sweating.

I. The water of the bath may vary from six to fourteen inches deep, or more; its temperature from 45° to 85°—at an average 60° of Fahr. The duration in the bath may be from one to seven minutes, according as the reactive powers are weak or strong; and according to the amount of cooling the patient finds necessary or agreeable, if the sweating process has preceded. It is sometimes needful to commence the bath warm or tepid, and cool it down to the desired coldness; or *two* shallow-baths may be used side by side—one *warm* and the other *cold.*

II. For the sake of exercise and the purposes of reaction, the patient, if able, should engage diligently in rubbing and washing. The limbs, chest, stomach, and bowels should be well frictioned for him, if he cannot do it himself. In any case, the bath attendant to rub thoroughly the back, loins, hips, sides, and legs; and occasionally the patient should wash or sponge the head and face. On coming out of the bath the patient to be enveloped in a large dry sheet, and well rubbed and dried. He ought to dress quickly, to dispense with the cares of the toilet, and hasten to his prescribed exercise; taking care that *the exposed hair is* DRY.

III. If a patient *cannot* take exercise after the shallow-bath, it will be the safest plan, and best keep up the reaction, for him to go to bed for a time, to be well covered up and rubbed well all over. At all events, he must keep in a warm room, if the weather be cold; or he may take arm exercise, if he is prevented taking foot exercise. But exercise in some shape is of consequence if the full benefits of the process are to be realized.

IV. The shallow-bath, *tepid and cooled down*, may often be substituted for the sitz-bath, or the douche or the wet-sheet rubbing, as a cooler, bracer, refresher, and cleanser of the skin on coming in *heated* from exercise, but not when perspiring profusely, or more particularly when in a state of *fatigue* or *exhaustion.* In such cases my advice is to rest quietly and cool gradually, rather adding to than diminishing the clothing, till the equilibrium of the system is restored. I then order, as preliminary to any bath, a few minutes' rubbing with a dry sheet, the patient and bath attendant assisting. This insures a glow and feeling of warmth. You will perceive that by these rational and common-sense precautions

the full benefit of my operation is insured, without incurring risk.

P.—I do perceive the benefit and mutual advantage of *practical* as well as theoretical teaching, and that they should go hand in hand. I find you frequently mention the *warm and tepid bath cooled down.*

Dr.—It is a safe and luxurious mode of taking a bath, in some cases a necessary modification, and highly beneficial. It is of the greatest use in initiating delicate and nervous persons to cold bathing. In the treatment of children it is of great utility. It was but the other day that I had a physician here very prejudiced against THE CURE; of pallid complexion, rather bloodless, and in below-par condition. "What could be done in such a case as his," said he, "where cold water always produced disagreeable effects?" I persuaded him to try a warm-bath, accompanied by the necessary performance of rubbing, &c., and then to add cold water, at two or three intervals, sufficient to cool the bath down to the natural temperature; the rubbing repeated in the intervals. When done, he expressed himself much pleased with the operation, and said he had no idea of such an agreeable modification of bathing. Had he produced a *gentle* perspiration with the lamp, before going into the warm shallow-bath cooled down, perhaps the word "*perfection!*" would have escaped his lips.

P.—I dare say now, your learned friend knew how to *mix* every drug in the "Pharmacopœia," its history, the numerous preparations it enters into, and its chemical decompositions—*most* of which were surely invented for man's sins, and the detriment of his memory and mucous membranes. But the *mixing* of hot and cold water, to *rouse the dormant energies of the skin*, to *soothe its sentient surface*, to *refresh the nervous centres*, and to *improve the circulation of the blood*, I will venture to say, without prejudice, never once entered the mind of your *orthodox* medical friend;—a mind no doubt so profoundly burthened with heavy mildewed stores of antique medical lore, so crammed with fastidious forms, and the innumerable pharmaceutical formulæ for meddling medicinal ministration, as to leave vacant neither nook nor cranny, where NATURE—long deserted dame—might still vainly hope, with *all* her benign solicitations, to find a fitting seat or resting place for her fairest and favourite daughters, her pride and joy—true SCIENCE and SIMPLICITY.

Dr.—O patient! true disciple of water-cure treatment, you are sententious. Now go and calm your combativeness with a tranquillizing sitz.

THE SITZ-BATH.

CONVERSATION CIII.

PATIENT.—WILL you define to me precisely the objects aimed at, and the effects accomplished by the sitz-bath?

DOCTOR.—The sitz-bath is, in fact, but a still more partial shallow-bath, but as it admits a much longer stay in it, its applications are more diversified. It is, therefore, a more complex process, and requires more discrimination in its use.

P.—The outlet of heat being from a diminished surface, its effects, I presume, will be more local in direction, *your idea being, that although the physiological effects of the processes vary with their several kinds, yet that they are all only modifications of one and the same operation—derivation* to wit.

DR.—That view of the matter, I believe, is unquestionable. The specific, primary, and essential effect of the sitz-bath, as of every other, is *derivative*. It is by this action that it operates all its curative effects, whether these be called by the name of *tonic*, *stimulant*, or *sedative*. It depends altogether upon the *degree* and *duration* of the derivative action, whether the ultimate effect upon the body be *tonic*, *stimulant*, or *sedative*.

P.—In that case, the *degree* and *duration* of the derivative action will be regulated by the temperature and depth of the water, and the time the patient remains in it?

DR.—Quite so; in other words, by the amount of heat abstracted. The greatest and longest abstraction of heat a patient can safely endure, is the highest sedative effect we dare operate, or can ever be called to operate. Short of this, there are all degrees of sedation. And herein precisely lies one of the greatest practical recommendations of the water-cure, the facility and precision with which its *doses* can be meted out, according to the necessities of the disease or the strength of the constitution. The abstraction of heat for a brief period, but intense in degree, operates a powerful stimulant effect. A series of these temporary stimulations of the organic actions results in a permanent exaltation of the tone of the system. Hence a sitz-bath administered in this way is said to be *tonic*. But the derivative action of the sitz-bath is its true *modus*

operandi. It depends very much on how this action is created, and the extent to which the bath is carried, whether the effect is to be *sedative* or *stimulant.* For these are the specific objects for which the bath is prescribed. In the latter case, action is short, but decided. The water in the bath is colder, and the stay in it briefer, say from five to ten minutes. In the former case, that is, when the object is to produce a sedative effect, the temperature of the water is higher, and the continuance in it longer, say from twenty minutes the minimum, to three quarters of an hour, or so, the maximum.

P.—I see it clearly. The *derivative* action of baths given after the hydropathic fashion is the great fact to dwell upon, whether they are to be *sedative* or *stimulant*, is just as they are used, just as the skill or practical experience of the practitioner modifies their administration?

Dr.—It is so precisely. For example, the alleged lowering effect of the sitz-bath occurs only when derivation *is pushed too far* relatively to the powers of the patient, when the outgoing of heat is rendered excessive by the prolonged operation of cold. Nevertheless, even here, the revulsive action is all in all. The part that has been the outlet for so much heat, has been the scene of an immensely active traffic in circulating materials to supply the vital processes that compensate the vital drain. Of course, the expenditure of so much organic energy as is implied in these operations cannot take place without reducing both the force and the rapidity of the pulse.

P.—What are the peculiar excellences or advantages of the sitz-bath, as a derivative?

Dr.—The facility with which we can subject so large a surface of the body, and so near the vital parts, to a temperature at an average of thirty degrees below blood heat, for a time usually varying from five to twenty-five minutes or more.

The agreeable excitation of nervous power, both organic and animal; the strong outgoing current of fluids from all the interior parts of the body to the surface submitted to the cooling influence, the immense combustion of corporeal particles necessary to the generation of the large amount of heat evolved; the exaltation, in short, of all the chemico-vital processes of the living laboratory;—all these explain the beneficial effects of the sitz-bath in the diseased conditions it is called on to remedy, show its capabilities of extensive application, and the reason of its deserved popularity.

P.—Your explanation is true to your theory, I see; or your theory true to your explanation. It seems, then, that in this powerful revulsion or diversion of the fluids to the surface, and in the disgorgement of the congested vessels of interior membranes and viscera, to supply the blood for this purpose, lies the chief value and efficacy of the sitz-bath.

You have given me, at length, a clue that will unwind me out of the labyrinth of many a difficulty. For example, I used to puzzle myself how marvellously, often, the sitz-bath acted as an opiate on sleepless nights; or on another occasion made me *fresh for a long walk, when tired and good for nothing.* The determination of the circulating fluids and the transference of nervous energy from the higher organs of the body to the lower, and the *tonic* and *refreshing* effects on the *brain*, and at the pit of the stomach, solves the mystery. I was fidgetty and restless, my thoughts kept me awake, my brain was excited, the circulation therein too active. By a physiological expedient, equally pleasant, safe, and prompt, determination of the blood was transferred elsewhere, the nervous excitation removed with it, and the impediment to sleep thus removed.

Dr.—You have a tolerably good idea of the matter. On the same principle this remedy, in some cases, removes headaches, nervous or bilious; stays vomiting and sickness, relieves flatulence and spasms, obviates constipation, aids in the cure of diarrhœa, because it reduces irritation, and operates the disgorgement of tissues whose congestion lies at the foundation of the deranged functions named.

P.—In what classes, or cases of disease, do you most frequently prescribe the sitz-bath?

Dr.—The sitz-bath being the local derivative, at once the most powerful and the most easy to *dose*, and therefore always safe to administer, besides being a bath always ready, always at hand, and taken with little trouble or assistance, it is largely resorted to, especially in chronic diseases, wherever internal congestions have to be relieved, or tone given to the digestive organs. Its measure and its frequency are determined, of course, by the necessities of the malady and the stamina of the patient. Of this the medical practitioner is the best judge, and should be the sole arbiter. The sphere, then, of its applicability embraces the entire class of visceral diseases, chronic congestions of the brain and the other nervous centres, of the lungs, heart, stomach, bowels, liver, kid-

neys, uterus, &c., in hæmorrhoids and hæmorrhages associated with them, in the disorders of menstruation, in the local injuries inflicted by, and in the tendency to, miscarriages and severe labours, in constipation and diarrhœa, in jaundice and dropsy, &c., &c. But the more special applications you will find detailed in the few rules I shall attempt to lay down for the safe and effective use of the sitz-bath; and the illustrations I shall give at a future period.

P.—Will you now favour me with these rules?

Dr.—In the first place, as one essential condition of the full benefit of the sitz-bath, as of every other bath, is the taking of active exercise to the point of a comfortable glow, *before* as well as *after* its administration; this rule, when practicable, should never be neglected. Its object is, in the one case, to equalise the circulation, as much as possible before the bath; and, in the other case, to maintain reaction as long as possible after it.

II. The best time for the sitz-bath is between meals, after the digestive processes are finished, yet with ample time to allow for the necessary exercise, and due rest after it, before the arrival of the next meal hour.

III. The temperature and duration of the sitz-bath are points of great importance to regulate properly. The sitz-bath has been much abused by the excessive coldness and quantity of water, its too long duration, and its too frequent repetitions. In this way they chill too much the abdominal organs, and only aggravate the congestions they were intended to relieve. When the object is to produce a *sedative* effect, to reduce excessive action, the temperature of the bath must be higher, and the continuance in it longer. The water to vary from 65° to 85°, and the duration in it from twenty minutes to an hour. It may be tepid, or chilled, and *cooled down*. When the object of the bath is to produce a *stimulant* effect, then the water in the bath is to be colder, and the stay in it shorter, say a temperature varying from 45° to 65°, and the time in it from five to fifteen minutes. This is the bath prescribed where the object is simply to brace the system generally, to tonify the stomach and bowels in particular. The *stimulant* sitz-bath is, therefore, a great resource for patients afflicted with diarrhœa, constipation, hæmorrhoids, and in the convalescence from most chronic disease.

IV. In most cases friction, with the wetted hands, of the loins and bowels, assisted by the bath attendant, while in the sitz-bath,

aids its effect. In all cases where the *stimulant* effect of the bath is sought for, it is desirable for the patient to join himself in the friction. But when the bath is used for its *sedative* effects, then the patient must on no account take any part in the rubbing, or exert himself otherwise in the bath; such exertion proving too exciting to the heart and brain, and counteractive of the effect desired. In such cases, therefore, it is imperative that the bath attendant alone sedulously ply the friction, if so directed. Some patients prefer to be left perfectly quiescent in the bath, an instinct not to be violated without good cause.

V. If the sitz-bath be prolonged, and especially if the weather be at all cold, the upper parts of the body should be well covered. One blanket at least should be tucked well round the neck, and thrown over the shoulders. In most cases, the chest, front and back should have a covering extra, as a wadded waistcoat, flannel, or shawl.

VI. In cases requiring the longer duration of the sitz-bath, whether for sedative or stimulant purposes, it is safer to make them shorter, and more frequent, than to prolong them to the extreme point of the patient's endurance. In the latter case, the risk is run of their determining internal congestions. In cases of neuralgia, they might fix the pain in the pelvic viscera, or intensify it in its own locality.

VII. In all ordinary cases, for example, chronic digestive disorder, two sitz-baths per diem may be taken, say at $11\frac{1}{2}$ a.m. and $5\frac{1}{2}$ p.m. At at average these may be prolonged to a quarter of an hour each; if for a derivative effect to half an hour each, and of a temperature between 50° and 70°. In particular cases, as in diarrhœa, they may be taken every four or six hours, but not exceeding ten minutes at a time, and of a temperature not lower than 65°, with well regulated friction all the time. In such cases, however, let me enforce it upon you, this is only half the practice, and *the least half*. It is a mistake to suppose, as Preissnitz at one time did, that obstinate cases of dysentery and diarrhœa, are curable by prolonged sitz-baths frequently employed. By such practice I know some mischief was committed. Such baths draw too much upon the vital powers, and exceed the just limits of reaction. Derivation, perspiration, and all tendencies to the surface therefore checked, and the intropulsive action which is set up instead, augments the interior congestion, and keeps up the intestinal irritation dependent thereon. In these cases the best practice is the sweating process, with the lamp or blankets, as the patient

can best bear it, to create a powerful revulsion of fluids from the intestinal mucous, to the cutaneous covering; and especially a hot fomentation of the bowels for half an hour or more, should precede each bath, and in the intervals, a heating compress, protected if necessary, by oiled silk, and a flannel binder. One of my favourite modifications in such cases, as well as in others, is to apply flannels wrung out of hot water to the whole abdominal region, during, and particularly at the commencement of, the lamp-bath. The attendant gives the steaming flannel to the patient, *under* the blankets surrounding the chair on which he is seated.

VIII. In cramps of the stomach, colics, &c., in addition to hot fomentations—which I shall speak of in their place in reference to this point—short cold sitz-baths of five or ten minutes, and shallow baths occasionally, *properly modified*, are advisable. If prolonged they effect decided, often immediate, relief. But they must be prescribed with great judgment, as their misuse may determine worse gastro-intestinal irritation.

IX. In nervous headaches, the prolonged sitz-bath is highly advisable, beginning first at a temperature of 70°—75°, after a quarter of an hour lowering to 65°, and at this heat continuing the bath for half an hour, or even an hour, if relief does not come sooner. But this bath is *so* allowed on the proviso that nothing in the state of the digestive organs contra-indicates its prolongation. Active friction of the bowels and loins at the same time is necessary to ensure its full action.

X. In cases of suppressed or retarded menstruation, or hæmorrhoidal discharge, two or three sitz-baths per diem, of 60°—70°, of from five to fifteen minutes duration, with the *wet-sheet rubbing after each*, and other processes indicated, will be very likely to re-establish the secretion, by operating the disgorgement of the pelvic viscera, or of the portal.

P.—I have heard your patients call the sitz-bath by all sorts of odd and fanciful names, such as the meditative sitz, the tranquilliser, hatching health, &c. It was a valuable adjunct in my restoration, that is certain. We water-patients are certainly neither dull nor dejected invalids; "alacrity" is our motto, and cheerful spirits, with returning health, are our reward—for *obedience to the organic laws*, and their physiological interpreter, the WATER-DOCTOR. Have you any more rules to lay before me?

DR.—I have much more to say, but I think it will be more appreciated in the form of illustration, and in another place.

THE SWEATING PROCESSES.

CONVERSATION CIV.

The blanket packing and lamp-bath, the safest, most physiological, and best mode of producing artificial perspiration—A revulsive and purifying process—Tonic, refreshing, and strengthening—Contra-indications to its use—Its abuse when first used as a remedy—Lamp-bath combined with fomentations and frictions —May be used anywhere—Impromptu lamp-bath at mine inn—Objections to vapour boxes and rooms—Rules and regulations—The blanket packing.

PATIENT.—I AM now anxious to hear all you have to say in recommendation of the different modes of producing perspiration, as remedial measures in your water-cure treatment.

DOCTOR.—Our best and simplest means are the *blanket packing* and *lamp-bath*, which I will describe to you presently. In fact, all other artificial means are comparatively defective and objectionable. Our mode of soliciting perspiration by *external* means is widely different in its results from that produced by giving medicinal sudorifics. After the latter, it is advisable to lie in a warm bed and recover by degrees from its weakening effects. After the former, a bath and a walk are taken, and it can be *repeated frequently* with evident benefit. After the drug, cold air and water are to be avoided, nor would it be safe to repeat the dose frequently. These admirable water-cure processes, when indicated, are equally applicable to the extremes of youth and age. They are, in proper hands, as free from all risk and danger as they are simple in their administration and excellent in their results.

P.—What is the true theory of perspiration in the simple blanket packing?

DR.—Heat is a powerful stimulant both of organic and of animal life. The effect of the heat of the body being retained by enveloping the body in several non-conductors, as blankets, is the same as applying so much heat from without, as it is not allowed to escape. For you are now thoroughly aware how large an amount of heat is constantly being generated by the living animal furnace. But this process of heat-accumulation, or reception of heat from without, cannot go on indefinitely, cannot exceed a certain point, without deranging the animal apparatus, or without becoming a source of disease. Hence, all-provident Nature has provided a safeguard against the heat of the body ever materially falling or

rising above the natural standard. Her power of quickening the chemico-vital actions by which heat is elaborated, is the provision by which she compensates any undue abstraction of heat, on the one hand; and her power of increasing the exhalation from the surface, and so by the conversion of water into vapour, as it leaves the body at every pore, absorbing an immense quantity of the superfluous heat, is the provision, or the other hand, by which she prevents the temperature from ever much exceeding the usual standard. The hydropathic sweating processes are simply scientific expedients for taking advantage of this last provision, or LAW, of the organism, in order to make it subserve the purposes of the cure of disease. The abnormal accumulation of heat irritates and excites the system, and calls forth its efforts of resistance, as against a foe whose ravages are inimical to life, and whose progress must be checked.

P.—In what do these efforts of resistance chiefly consist?

DR.—Here is the point. The ganglionic nervous system—the great controller of the purely vital or organic actions, and especially of the circulation—is roused into powerful action. The heart beats with renewed energy, the blood-vessels participate in its impulse, and carry the blood forward with augmented power and speed, clearing all obstructions, producing a great movement and determination of the fluids from the central to the superficial parts of the body. However chilly, hard, dry, or bound the surface may be, this centrifugal effort soon forces the perspiratory outlets of the skin to yield. With the pouring forth of sweat, and with it the extrication of an immense amount of the surplus heat of the body, comes instant relief—a subsidence of the whole organic tumult raised expressly to effect this purpose.

P.—That *rationale* is very clear and intelligible. And it stands to reason, that the more the determination to the suface, and the activity of the cutaneous circulation is promoted, the more the arteries, capillaries, and veins of the interior viscera will be unloaded of their morbid accumulations. This much at least of the science of the matter; of the *modus operandi* of such a curative agent, I have learned from your explanations.

DR.—I see you perfectly comprehend this powerful *revulsive* and purifying process. Hence its extraordinary utility in chronic congestions of the LIVER and spleen, and in the obstructed viscera associated with chronic indigestion, rheumatism, gout, inveterate depression of spirits, and many cutaneous diseases.

P.—I believe complaints have been made against the sweating process, that is, against its abuse?

Dr.—Yes; at one time it was carried to extremes by water-doctors and patients; and, as the tendency of mankind is always to run into extremes, there is now the danger of its being quite as unduly neglected and malappreciated. It is certainly not a measure for *routine treatment*, or to be lightly, or indiscriminately had recourse to. This mode of producing perspiration, followed by the bath, was at first thought by Preissnitz, to be his great discovery. Stirring up the system and producing purgation and waste by the skin, strengthening this again, as well as the internal organs by the bath, was thought by him and many of his followers, so powerful, simple, and harmless an operation, that, combined with the *other salutary adjuncts* of the cure, no diseased state could resist it. When I had been about six months at Graefenberg I ventured to give my opinion to Preissnitz, with the reasons why I thought that he was carrying this operation *too far* and on *wrong principles*. After remaining with him about a year I took my departure, and soon after I heard that he had made a reformation in his practice, using the sweating process with greater discrimination. Having remained so long at Graefenberg, and being known to all the patients as "the English doctor, who was making such a good cure," I was frequently referred to by all the anxious invalids, and all new comers. In fact, I was the first English (medical) man, who went to Graefenberg, and was only preceded by one of my gouty countrymen. If I had not gone there, I dare say, it is more than probable that there would not yet have been a water-cure establishment in this country; but more of this anon. Although I had observed enough of the remarkable curative results of water-curing, *combined with sweating and the bath*, from seeing so much of those numerous patients, still I was soon alive to its abuses and misapplication. Preissnitz had so long been treated as little less than a prophet, or one inspired, that he listened to any remonstrance with much reluctance. But never was any man quicker in availing himself of valuable hints, or in putting the discoveries of others in their right places, and to their best purposes. This was shown by his use of the douche, the sheet-packing, &c., which had never been used before his time as constitutional remedies in chronic disease. Truly he was a man gifted with original genius, with the soundest common sense, and the greatest powers of appreciation.

The application of a cold bath after a profuse perspiration, is thought by the *many*, and even by *most medical men*, to be highly dangerous; but, in fact, there is nothing more innocent, or exempt from danger, when directed by a competent practitioner. It is of the *greatest utility* in *passive* diseased states, where action is below par, and in the very commencement of acute diseases, in the depression of power that precedes fevers and inflammations, for symptoms indicating the retrocession of the fluids of the body from its surface to the interior, and their undue accumulation there; in this early stage of violent or formidable diseases, of depression of power, in the collapse, shivering, *malaise* and *decouragement*, that follows a chill of the surface, or the imbibition of an infectious miasm, and *before* active irritation or acute inflammatory symptoms show themselves. But *after* irritation, or *acute* inflammatory symptoms have set in, it is contraindicated and highly improper. The sweating process is therefore *as a general rule*, but there are exceptions, inadmissible in all *actually feverish* states, in *acute* catarrhs and influenza, whether obscurely or clearly connected with local inflammation, as of important viscera; wherever the heart is abnormally excitable, or wherever there is active determination of blood to the head.

P.—I see it requires some discrimination, when disease exists, to prescribe even these simple and salutary processes.

Dr.—You say truly. The following hasty remarks were *written before* I left Graefenberg, and long before the water-cure was heard of in this country. You will find them in my *first work* on the water-cure, printed in 1842:—

"In most cases, where there is much nervous debility or a tendency to hypochondriasis, where there is much determination of blood to the head, or the existence of chronic inflammation on the digestive mucous membrane, or the alimentary canal, or any of the internal organs, the sweating must not be practised, or with great *care* and *discrimination*, and only at *intervals*. Where these contraindications do not exist, and the sweating still produces a loss of flesh, or an increased state of irritability, and when the patient does not feel well, and obtain full reaction after the bath, in such cases it is advisable to discontinue it. It is sometimes necessary to apply a wet compress on the forehead before and during the perspiration, changing it from time to time; and there are also cases where the patient is made to sweat in the wet sheet, but they are rare; and when it is thought necessary, it is generally better

to omit the operation, for it shows some contraindication. Whenever there is a *great* tendency to fever, where *acute* symptoms of a cold or influenza are coming on, the sweating must not be attempted: it sometimes aggravates all the symptoms. In these states the sweating must be replaced by the wet sheet. I have observed that those whose skins are white and delicate, persons who have much fat, gouty and rheumatic, sweat easily, and in great abundance. On the other hand, where the temperament is phlegmatic, where there is a tendency to piles, or congestion of the abdominal viscera, it is not so easy. Sometimes the perspiration is *partial*, not appearing at all on certain parts; this may arise from the existence of diseased action, or the accumulation of morbid matter in the part. When this is discovered, it is advisable, previously to enveloping the patient in the blanket, to apply a compress or bandage, *wrung* out of cold water, to the part.

"With the repetition of this process, great changes take place; at first the perspiration is small in quantity, clear in its nature, and difficult to be produced; it becomes profuse, and impregnated with the most disagreeable odours, viscid and glutinous, of a dark yellow, and even brown colour, and sour, fœtid, &c., in its smell. In other cases, the patient will tell you, that during the first two or three perspirations it tasted *very salt* and *briny*, when flowing over the lip, but afterwards became all but tasteless. When these morbid phenomena appear, the perspiration may generally be considered critical. As a general rule, where there is no evident reason why it should not be used, sweating, followed by the cold bath, *is not debilitating;* what is lost in one way is repaired in another. The appetite is so much increased, and the functions of the digestive organs so improved, that more healthy fluid is formed than is thrown out. *Fat* is replaced by hard *elastic flesh*, and *langour* and *debility* give way to a state of *cheerfulness* and *activity*."

P.—Are the cases of marked debility, or delicacy of constitution, inherent or acquired, and persons whose nutrition is much impaired, unsuitable for the sweating process?

Dr.—By no means. But such patients require to be gently initiated into it. It is only under too frequent and *excessive sweatings*—the *abuse* of the process—that it is injurious to such patients. As I am accustomed to manage those patients, the gentle sweating in the lamp-bath, with *sometimes* a hot fomentation to the abdomen at the same time, operates most satisfactory

results—soothing irritation of mind and body, taking a sensible load off the springs of life, and in a short time too, cheering on the hopeful anticipations of the patient, and *eventually bracing and invigorating the system* in the highest degree. How often have I heard patients exclaim, after this process, "Doctor, I feel young again!"

P.—It is a common opinion that perspiration is a weakening process. How far is this true?

Dr.—It is quite a mistake. Sweating by other artificial processes may be weakening; but the hydropathic sweating, *properly directed*, never is. So far from debilitating, it is, on the contrary, highly invigorating. The patient is at perfect repose in his wrapping, on his chair or in his bed, and nothing of the *normal* constituents of the body is abstracted, *save the saline water of the blood.* This may be replaced by absorption from the stomach as rapidly as it is given out. For when the drain comes to be excessive, the supply of water is in proportion. But let me remark, it is only in very *pure* systems that pure water comes away. Where the system is impure, as is the case with most cases of chronic disease, where corrupt humours exist in great quantities, where the *secretory* and *excretory* functions are imperfectly performed, or some of them entirely arrested, the retention, whether in or out of the current of the circulation, of matters that should have been eliminated, converts them into an actual morbid matter, an element of disease.

The powerful perturbative action established in the system, the *revulsion and general movement of the fluids to the surface parts of the body*, and *the drain effected of the serous or watery part of the blood, the* PART *that* IS CHARGED *with the morbid elements*, tends to dislodge, and break up, and carry off, all the palpable material principles of disease; in short, to purify the blood—*literally to rinse out* its channels, to cleanse the vital sewers—if you like—to solve obstructions. This is *one* source of the immediate relief to *malaise* felt by many people while under the process.

P.—Well; this *revulsion to the surface*, this scouring process of the corporeal passages, and the easy exit it affords to excrementitious matters, or morbid principles, being the immediate benefits to the constitution, of the sweating as you manage it, what are the most obvious of its permanent advantages?

Dr.—Of course these vary with the disease under which the

patient labours; and it would swell out our conversations unduly, now, to illustrate them by cases. These I will lay before you in another book. Suffice it to recapitulate, for the present, some of the common changes effected on patients, whose complaints are in other respects the most diverse. Whether the patient suffer from chronic *gout* or *rheumatism*, from confirmed or a periodical *biliousness*, from *scurvy*, *secondary symptoms*, from *diarrhœa* or *constipation*, from simple *dyspepsia* or inveterate *low spirits*—the following are the indications of the new life and energy imparted to their systems. Their *skin* and *digestive organs* are in an immensely improved condition, and the source of all the other benefits the health has received. Flabby fat, or unhealthy flesh, steadily disappears; or, more strictly speaking, is decomposed and eliminated (burnt off, if you like), and its place supplied by healthy, hard, and firm muscle or flesh. The heavy languid step gives place to elasticity and buoyancy. As I have said before, hope and hilarity appear like the sunshine of day, radiating in countenances where erewhile despair, dismay, and dejection sat. The *weariness* and *weakness* that before overwhelmed the patient on the least exertion, are now succeeded by *energy* and *endurance*.

P.—I have been told that the lamp-bath has, in some measure, superseded the blanket packing?

Dr.—Only to a certain extent. The blanket packing is too valuable a means to be lightly thrown away. We often find that no other plan so well fulfills the indications in many cases where sweating is necessary. There is no doubt that the lamp-bath is the favourite; it is a much more expeditious process, and admits of more variety in its modifications. It has many advantages peculiarly its own, and when skilfully managed accomplishes many of the best aims of the blanket sweating.

When any end can be served by long sweating, when it is an object to prolong the revulsive action, where it is evident that there are morbid matters to be eliminated, then the lamp-bath may be used merely to start the perspiration, and thus save time. The patient is then laid in bed with his warm blankets about him, and packed with additional blankets, so that the process may be kept up, and go on for the time prescribed, without disturbance and without excitement.

P.—In what diseases do you find this modification of use?

Dr.—In some cases of chronic gout or rheumatism, especially in robust subjects; in affections of the liver and kidneys, and in

dropsies thereon dependent; in secondary symptoms, and various forms of obstinate skin diseases, as *psoriasis inveterata.*

P.—The lamp-bath seems to be one of your favorite operations?

Dr.—It is very manageable, and may be made a most luxurious and salutary proceeding. I frequently avail myself of its benefits.

P.—Well, it was but the other day that I heard a gentleman declaim against the lamp-bath.

Dr.—I heard him too, and he did not complain without some cause. It appears, before coming here, he had been in the hands of a person not qualified to undertake the management of such cases. I found that he was a deplorable sufferer from dyspepsia, with feet that became cold immediately after exercise, added to which, there was slight congestion of the brain. He complained that he had sat half an hour in the lamp-bath, with cold feet and a hot head, and that the longer he remained the colder became the feet, and the more heated and oppressed the head, and after all with little or no perspiration. Nothing could be more irritating to an invalid in his condition than such a position. I have since heard this gentleman say, that he found the lamp-bath followed by the tepid bath, cooled down to its natural temperature, a "panacea, and one of the greatest luxuries," whenever it was judged proper for him to take it. The change in his opinion was wrought simply in this way: a pan of hot water was directed to be placed for the feet, during the first twenty minutes of the bath, and to apply half a yard of flannel, wrung every ten minutes out of hot water, on the abdomen, as a lady does her muff. I also ordered the lamp to be extinguished for a few minutes, two or three times during the process, or as often as the heat was felt at all oppressive. In this way he sweated profusely without any sense of oppression, and I have felt his head and face quite cool to the touch, when dripping with perspiration. I should mention, that I had ordered the bath-man, as soon as perspiration showed itself, to rub the bare neck, shoulders, back, and loins, briskly and steadily by insinuating the bare arm down under the blankets. There is no necessity whatever that the blankets should be tight about the neck, they answer better by being merely approximated, loosely and comfortably. *A soft hair glove*, instead of the bare hand, used to rub gently, the oozing skin, I have found of great advantage, and very agreeable. This patient, in a few weeks, found the adjuncts I have mentioned for producing perspiration no longer necessary; his feet were always warm, his head cool, his old store

pills no longer wanted, and his temper (omitting other symptoms) showing unmistakably that rapid recovery was taking place. A simple proof of the strong derivative effect and power of this refreshing process, is the fact, that for some time afterwards the arms and legs, feet and hands, *feel larger*, and the whole person more robust. This is fact and no fancy, for I have often myself after a lamp-bath, found my easiest boots, and I take care to have them all easy enough, almost too tight to pull on. This with the walk, slowly subsides, but you perceive that, notwithstanding the copious drain of watery particles (and I have often, as my man will tell you, sweated freely in this quiet way for above an hour), how *great a body* of blood must have been transferred pro tem. *to the surface and extremities of the body*, that might a short time before have been adding to the *stagnation* of a *torpid* or *congested liver*, an *oppressed pair of kidneys*, *a weary head*, or *morbid mucous membranes.*

P.—There is an objection to your remedies that I have heard remarked by many people, that is, that they cannot be obtained anywhere, as you get your prescription for two pills and a draught made up at the druggist's.

Dr.—I am glad to set you right in that mistaken view of the matter. My personal experience has been considerable as regards both kinds of dosing, and I have no hesitation in saying that my present prescriptions are quite as comeatable, cheaper, *their operation sooner over*, and last, but not least, have the addition of being *agreeable* in their working and administration. As briefly as I am able, I will give you a modern instance, to show at least, that where there is a will there is a way. I was obliged to visit London, during the last great influenza, when such crowds were laid up with it. From having sat up the small hours of the night for several preceding winters, with other necessary sacrifices of health, for what I had to do, I was not well, in fact, I was in below-par condition. In the face of this, I dined out every evening, and on awaking the *fourth* morning, found I had all the symptoms of influenza in their severest form.

P.—I suppose you had been drinking above half a dozen glasses of wine every evening with your noble friends?

Dr.—I am sorry to confess as much. I had taken at each dinner too many glasses of champagne and too many of burgandy; *premiere qualité*, you may be sure, but no port or sherry; nevertheless, I was afterwards deservedly punished. Not having

been accustomed for many years to alcohol, or intoxicating drinks in any shape, these nightly repetitions made my mucous membranes and nerves infinitely more excitable and susceptible of the worst influences of the epidemic. On putting my nose out of bed that *fourth* morning, violent sneezing ensued, accompanied with chills and cold shiverings, added to which, there were weariness and pains in the limbs, as if I had received severe injuries. In a strange hotel, I sighed for my water-cure establishment and its appurtenances, and felt the feeling of a long laying up casting its shadow upon me. What was to be done? I called in BOOTS, and after *consulting* him, I sent for some *spiritus vini rectificati*, a shillings worth, from the next druggist. With this he brought me a teacup and a *wooden-bottomed* chair from the kitchen. I put the spirit in the cup, and this in a small bason with three inches of water to prevent its cracking, and a penny in the cup as ballast. When this was placed under the chair I sat down, with two folded shirts as a cushion, to keep off the heat of the chair. Boots then arranged six blankets one behind and one before alternately, putting me thus in a small tent, with my head out. I perspired freely for more than three-quarters of an hour; twice during the operation, feeling unnecessarily warm, I had my shaving box put on the teacup, which at once extinguished the flame, and enabled me to go on perspiring at my ease. When I had luxuriated sufficiently long in this state of general thaw, for truly the feeling of relief was very great, I directed the attention of boots to two sheets, and half a bucket of water, which had been placed in readiness. One sheet he dipped in the water and wrung sufficiently not to wet the room, then throwing off the blankets and standing up I was enveloped in it, and we both commenced active rubbing. Again the sheet was dipped in the water and the rubbing repeated, once not being sufficiently refreshing. The other sheet served to dry me well, and I returned to bed. Boots, who had soon become an *amateur* of this novel proceeding, gave me *his* parting *opinion* on leaving the room with the chair and bucket, by saying "Its really my belief that's a great dodge, sir, and I've no doubt you have broken the neck of him," meaning the influenza.

P.—Well, what was the result of your impromptu water curing?

DR.—In an hour I had some tea and dry toast, which produced a disposition to natural perspiration, which, of course, was encouraged. I dozed away the day in bed, fasting and keeping *very*

quiet until evening, when I initiated boots into the mystery of wet-sheet packing, which he did remarkably well. I slept in the sheet for an hour and a half, and then, for want of a bath, repeated the morning ablution with the *dripping-wet sheet.* Next morning I packed again, in the evening was sitting up in my room, and the next day went into the country in a close carriage, *feeling well,* but languid; hitherto I had eaten nothing but a little toast with my weak tea. I may say I was *quite well* the fifth day, and had suffered no pain, and but little inconvenience.

P.—I suppose you would have taken some medicine if you had thought it necessary?

Dr.—Certainly. A dose of castor oil, which is often first rate, or any other dose clearly indicated. How often I feel regret when I reflect what valuable adjuncts medical practitioners (of any school) throw away, when they refuse to prescribe our simple processes as domestic remedies in private practice. A lamp-bath and warm-bath cooled down, a packing and dripping sheets, a fomentation, compress or sitz, would often be invaluable as additions to some drug medication, in the common transitory ailments that make up an ordinary medical practice. The time will come for this.

P.—I suppose your processes might be used with immense remedial results in hospitals?

Dr.—Why not? why should not the poor benefit by the same means there, as ladies and gentlemen do in *my* hospital. A hospital is a real blessing when illness overtakes an individual, for there the inmates are practised and drilled, there is no temptation for the sufferer to go wrong, and all the machinery is devoted to one purpose, to one production—health.

P.—How is it that so powerful a drain and revulsion as sweating has escaped the medical profession, and so seldom used as a remedy?

Dr.—The act of passive or artificial sweating, without being followed by the different modes of ablution we enjoin, would not be attended by the curative results, either immediate or remote, we accomplish. The bath is the *sine quâ non;* without this addition its efficacy would be lost in the treatment of slow or chronic disease. This is the reason why so great a remedial agent is all but negative in the hands of the medical profession. They know only of the *debilitating sweating* by drugs and the vapour-bath.

P.—As you consider the bath an essential complement or ap-

pendage of all sweating processes, however performed, what are its specific objects?

Dr.—In the sweating process the nerves and vessels of the skin must necessarily be irritated, and its whole tissue at last relaxed, from the heat and stimulation they have been subjected to on the one hand, and from the copious floods of fluids that have oozed through them on the other. The *bath* taken then, at the end of the process, is a highly physiologic and philosophic procedure. I see you now perceive that it is the most *direct* and *effective means of giving immediate tone to*, and constringing the relaxed vessels and tissues of the skin.

P.—Oh! I perceive how needful, how well timed, and how appropriate, then, is this bracing operation, and how grateful it must be to the patient. You deplete, reduce irritation, establish a grand derivative action, and then march in with your tonics and refreshers. I suppose that the more freely the skin has been acting, the larger its flow of fluids, that the greater will be the degree of cold that is desired; the better will it be borne; the more potent will be the stimulus it affords; and the better the reaction that will ensue; in short, the more decided and permanent will be its curative agency.

Dr.—Relatively to all the diversity of cases it is so. Hence the feeling of immense relief, exhilaration, of actual renovation and vigor, experienced after a process that to a superficial thinker or observer would seem wasting and exhausting.

In pointing out to you how easily you might get a lamp-bath, in case of sudden illness at your inn, I forgot to mention that if symptoms of inflammation of the windpipe (*laryngitis*), or of the air-tubes (bronchitis), had shown themselves, I should have instituted a hot fomentation with half yards of wrung flannels, to the throat and breastbone, both before, during, and after the lamp-bath, and that also in case of spasm, cramp, or pain in the stomach and bowels, the *steaming flannels* should be applied to them in the same way.

P.—I see you attack the enemy's outposts and lodgments, and circumvent his plans at all points. *Laryngitis*, I believe, is a very dangerous malady, and sometimes kills a man before twenty-four hours are passed, *notwithstanding*, as I have heard, his having been bled within an inch of his life, or leeched, blistered, and calomelised within an inch of the grave.

Dr.—True. A great many die in this way, but they are bad

cases, and often *neglected* until beyond the aid of human means. The simple operation of making a small hole into the windpipe to breathe through has saved some lives, when all else were lost. If you are ever threatened with *laryngitis* try my plan *without loss of time.* Perspire freely with the lamp, and foment the throat and breastbone at the same time, also put your feet in hot water with mustard; go on until you have had enough of it; bathe in warm water for three or four minutes, and then cool the bath to 70° for three minutes more. Return and rest in bed, and continue fomentation. Sweat, foment, and bathe again, if necessary. I have had a severe attack of *laryngitis,* indeed more than one, which, I have no doubt, would have ended my career in less than twenty-four hours if left to itself,—in less than an hour I could not attempt to swallow, and the larynx was immovable. I treated myself as I have advised you to act, if you should ever need it. In addition, I took a dose of castor oil. I altogether made short work of it. If necessary you can bring up your reserves at once, and taken an ounce of oil, or a dose of calomel, and two ounces of black draught, or any other appropriate dose, and still work away with your main forces. A powerful revulsion once and away on the alimentary canal may be well justified. Castor oil, by the way, let me tell you, I have discovered, has a great affinity for bile; being a purgative matter and *fatty also,* it seems to draw out and join the bile, but does not *stay* to amalgamate with it; on the contrary, it goes on, very quickly, with its bitter companion, down the alimentary conduit, its destined way.

P.—I suppose you would attack the inflammations of the different parts of the air-tubes in younger subjects, much in the same summary way?

Dr.—Yes; but with modifications and additions, which I will explain to you by-and-bye.

P.—I think a great recommendation of your lamp-sweating above the *hot-air* and *vapour baths* is, that the head is cool and free, is out of the heated atmosphere. I should suppose that the breathing of the hot atmosphere of a *box*, or a *room* in which the patient is confined in such cases to be highly objectionable.

Dr.—Assuredly. An atmosphere, moreover, not only not renewed as its oxygen is exhausted, but further poisoned with steaming exhalations of diseased bodies forced to part with their noxious elements by the skin. Just figure to yourself such an odorous chamber, and being compelled to swallow again by the

lungs the morbid elements of the body. Such a process is highly objectionable, and there is *now* no excuse for it. It goes to taint the very fountains of restoration by interfering with the purification of the blood. Pure cool air, for decarbonising the blood, the ready outlet for a poisonous excrementitious principle, and the facile and ample reception in its stead of the vivifying oxygen and electricity, is the prime condition of the health of breathing animals. The highly rarified air of such a bath is an objection too; air highly diluted in its prime vital elements is highly objectionable, as leaving the blood without its due amount of its natural purifiers. An abnormal amount of carbon therefore remains in the blood. To the noxious influence of this, the whole organism, but especially the *brain*, is very sensitive. According to the extent of the deficiency of respiration is the degree of narcotism induced, or the general symptoms of empoisonment.

P.—Pray, say no more. If such baths are persisted in, now that there is no excuse for them, *now* that a better mode is pointed out, so simple, safe, and physiological, the penalty of perverse folly must rest with those who commit the error.

You have already satisfactorily disposed of the objections to bathing the body in cold water after *passive* sweating, and I have no more questions to ask just now regarding this most interesting subject of artificial perspiration. I am now therefore prepared to hear any further counsels you may have to give me in order to ensure the due administration of so invaluable a resource of curative art.

Dr.—Several of the following cautions and directions I have already given; but, in a practical point of importance, mismanagement must be carefully avoided.

1. A point of consequence in the sweating process, whether in the blanket packing or the lamp-bath, is, that the patient has the air excluded about the *feet* and *neck*, and the latter without discomforting the patient in the least. The packing in the blankets must also be as comfortable as possible, and as soon as the perspiration is fully formed it may be loosened a little, and the air also may be freely admitted into the apartment, provided the patient be not in a draught, or the *weather damp* or *cold*. In waiting for the perspiration to break forth the patient may safely fall asleep in the blankets.

2. The early morning is the best time for the blanket sweating. Everything is completed comfortably, the walk taken, &c., before

breakfast. The lamp-bath may be conveniently administered about 12 a.m., and with many patients is preferable.

3. To refresh, or make up the loss of fluids, the patient, if disposed, may drink half a tumbler of water occasionally, say two or three times during the operation.

4. In sweating, and in fact under all the other processes, the brain and nerves should never be injuriously excited. Perfect quiescence therefore should reign around the patient. Thought or much talking should be interdicted, and everything to excite the temper avoided.

5. If, before the perspiration breaks out, the patient becomes uneasy, irritable, or flushed in the face, he should be unpacked and a gentle perspiration produced with the lamp-bath, before cooling in the shallow-bath.

6. In those disposed to headache in the sweating process, a compress, or fomentation to the stomach and bowels, is a good counteractive, and sometimes a cold compress to the head.

7. Any inflamed, swollen, or tender part, as rheumatic or gouty joints, boils, or painful eruptions, &c., should be covered with a wet compress or fomenting flannel; the object of which is twofold, to keep such parts meanwhile in a sort of vapour-bath till the appearance of sweating, and to allay the pains which might increase with the production of perspiration.

8. As a general rule, in febrile and inflammatory affections, never seek to *force* perspiration by direct means. It will in general come on spontaneously after the excitement of the system has been moderated by the appropriate water appliances. For in such cases, the immediate object and indication, are not to hasten perspiration, but to allay the local or general irritation; to produce first effectual *sedation* by appropriate means.

9. If in perspiration fully formed, any particular part of the body remains dry, it is well to apply a compress or fomentation to that part.

If a critical perspiration comes on in an acute disease, *by no means seek to arrest it by any abrupt or violent means.*

10. After sweating it is advisable that the patient should be sufficiently refreshed, and *cooled* in the bath, so that perspiration will *not again ensue* or break out by the active drying and rubbing with the sheet and towels which follow.

11. In some cases the *douche* is taken with great advantage after the lamp-bath.

It is of importance after the sweating, as after all the processes, that the patient be careful to promote and *keep up* reaction, by exercise, as soon as possible after the operation.

12. The sweating processes are particularly suitable for passive diseased states. Wherever active inflammation exist, with few exceptions, they are unsuitable. Wherever there is high pulse and hot skin, in *acute* catarrhs, or in severe influenza, unless in the *premonitory* or *shivering stage*. It is equally improper where the heart is abnormally excitable, and wherever there is active determination of blood to the head; in cases of chronic, not to say acute diseases, of the brain. In all cases of marked delicacy and debility of constitution, it is not advisable as a preliminary measure, but may be cautiously used as the patient begins to amend.

13. In all kinds of packing *idiosyncrasies* should be carefully observed and respected.

The blanket packing is effected in a very easy and simple manner. The bedding is removed, and a blanket or two, of large size, spread out on the mattrass. The patient laying down is enveloped as comfortably as possible, and so as to fit well about the neck and shoulders. More blankets, and a light down bed in a fine ticking, are tucked in over all. The head is placed as the patient may desire.

P.—What kind of spirit-lamp do you find answer best?

Dr.—I prefer a small tin cup about four and a half or five inches deep, and a little more than three in diameter, and this I put to stand in a small slop bowl, with two or three inches of water. Others prefer a lamp with a wick, but this, if not sufficiently large, hardly diffuses sufficient heat.

THE WET-SHEET PACKING.

CONVERSATION CV.

A great discovery as an antiphlogistic—Currie's affusions of a different character, and not so manageable—The degree of heat abstracted by the sheet fixed—Its soothing effects on the brain and nervous system—When the heat is equalized, forming a great body poultice—Softens the skin and promotes exhalation——Allays febrile excitement, and is followed by the most tranquillizing sleep—Fulfils many important indications in the treatment of chronic disease—Evidences of its power on the skin, in drawing out morbid matters—Ought to be a great domestic remedy in the hands of all medical practitioners—Mode of using it in fever—Rules and directions.

PATIENT.—I BELIEVE you water-doctors consider the wet-sheet packing one of the finest discoveries of Preissnitz?

DOCTOR.—Very true. The application of a wet sheet, as it is used in the water-cure, was a great discovery; whether we look at it in its admirable effects, or the extensive range of diseased states in which it may be applied with benefit, it may be truly called a most valuable resource of curative art. But, like every other powerful remedy, it requires to be prescribed with nicety and discrimination.

It is as an *antiphlogistic*, or means of subduing fever in its hot stage, and active inflammations—that it stands unrivalled, being *unequalled in its simplicity, safety,* and *efficacy.* It is an invaluable remedy in all diseases characterised by accelerated pulse and dry burning skin. Here it is certainly the noblest arm of the water-cure. It causes little or no loss of strength, and leaves behind it none of the debility which bleeding and strong medicines occasion. It always *ensures*, therefore, a *quick convalescence.* It is a remedy also easy to manage. In appropriate cases the most inexperienced person can hardly go wrong in its application, provided he adhere strictly to the few rules laid down for his guidance.

P.—Having read BROUSSAIS' (or *Brossais*, as I find your printer persists in spelling his honoured name) great work "DE L'IRRITATION ET DE LA FOLIE," by your kind persuasion—I imagine that this *antiphlogistic* and *febrifuge process* of the water-

cure, the *wet-sheet packing*, would have been a powerful auxiliary in his hands. I fancy it would have saved much leeching and other modes of depletion, carried too far by many of his followers.

DR.—If the "IMMORTAL BROUSSAIS," as the justly celebrated DR. STOKES (one of the first physicians of our day) calls him, in his Lectures, had known the wet-sheet packing, *he* would not have stopped at that. The great BROUSSAIS would have thrown the whole of his immense physiological and practical knowledge into a SYSTEM, whose theoretical and practical excellence would *at once* have been recognised by his original and fertile genius—nor would the simple and beneficent WATER-CURE have appealed in vain to a soul *so honest and uncompromising*, or to an understanding *so large and unfettered.*

P.—It is clear enough, that however one might differ on many points of theory or practice, with this great medical philosopher, practitioner, and teacher, still *all* must acknowledge that he was a generous, liberal, and disinterested man, whose long and laborious life was without guile, and devoted to science and humanity.

The celebrated Dr. Currie, I have read, applied cold *affusions* with great success in certain forms of fever?

DR.—He did, but Preissnitz' *wet-sheet packing* was a much greater improvement on the *affusions*, than they were on the ordinary antiphlogistics.

P.—In what does the superiority of the packing process consist?

DR.—First, in that, while it as effectually abstracts the morbid heat of the system, and reduces the excited nervous and vascular actions, *producing all the coolness and calm possible and necessary for the moment*, yet, by the very nature of the process, *the* DEGREE *of abstraction of heat is* FIXED. It cannot go beyond a certain point—*the heat necessary to warm the sheet.* In this there is every guarantee that the case admits of, that the vital powers shall not be unduly lowered, that an excessive amount of heat shall not be abstracted. This guarantee is presented in the shape of coverings of *dry* non-conducting materials (*blankets* and *down coverlets*), which prevent all escape and extrication of animal heat beyond what is first necessary to equalize the sheet with the temperature of the body.

The second point wherein packing claims superiority over affusions consists in this, that *the soothing effect on the immense sentient surface*, or nervous web *of the skin*, by soaking of its

tissues and the prolonged contact of the wet linen, the heat of the body converting its water into *vapour*, and constituting the sheet in fact *a great poultice*.

Again, the certain induction by the wet-sheet packing *of that moist state of the skin, which is the first condition of exhalation through membranes*, and thereby the promotion of those chemico-vital acts dependent on this exhalation. The skin and lungs are, as I explained to you in our physiological conversations, great agents in the motion and distribution of the fluids. This cutaneous evaporation is one of the aims for the practitioner to accomplish when he seeks to equalize the circulation, to determine the fluids of the interior to the surface. He acts upon the LAW that liquids move towards membranes through which evaporation takes place.

P.—I see. Here then is *one* of the sources and secrets of the sovereign virtue of the wet-sheet packing.

DR.—You are right. It facilitates and augments *exhalation* (*not perspiration*), at the time, and afterwards by the improved condition; for remember, that wherever cutaneous transpiration is *repressed*, the fluids of course cannot come freely to the surface. They therefore tend to retire inwardly, to accumulate in, or congest, the interior viscera. How powerfully, then, this *unbound function* of the skin operates *revulsion* from loaded interior viscera to the exterior, needs not a further word of comment.

P.—These are all, I admit, very important points of difference between the refrigerating plan of Preissnitz and Currie. This development at the same time makes clear to me the elements of the action of the wet sheet; in other words, its *modus operandi*. You will admit that the first impression of the wet-sheet envelope, the feeling of cold from the sudden abstraction of heat from the entire surface, is anything but pleasant?

DR.—Pardon me, if I in a great measure differ with you. In cases of febrile excitement, and after a few repetitions in many chronic cases, it is highly pleasant. It is a sensation of great relief, of exquisite comfort. It sometimes brings calm and soothing to nervous agitation, that had resisted everything else. Very often the patient is no sooner in the sheet than he sinks into a profound sleep. Notwithstanding all this showing *per contra*, I am quite free to admit that, with some patients labouring under chronic disease, the *first* impression is not so pleasant. But after all, this uncomfortable feeling is transitory, and soon gives place

to *reaction*, to agreeable warmth, and feelings of solace and composure. Hear what Sir Edward Bulwer Lytton says of the wet-sheet packing: *—

"I have found in conversation so much misapprehension of this very easy and very luxurious remedy, that I may be pardoned for re-explaining what has been explained so often. It is not, as people persist in supposing, that patients are put into wet sheets and there left to shiver. The sheet, after being well saturated, is well wrung out—the patient quickly wrapped in it—several blankets bandaged round, and a down coverlet tucked over all; thus, especially where there is the least fever, the first momentary chill is promptly succeeded by a gradual and vivifying warmth, perfectly free from the irritation of dry heat—a delicious sense of ease is usually followed by a sleep more agreeable than anodyne ever produced. *It seems a positive cruelty to be taken out of this magic girdle in which pain is lulled, and fever cooled, and watchfulness lapped in slumber.*"

As a matter of course, the *reaction* is the greater, and begins the more speedily, the more the patient improves in health.

P.—So much for the dreaded wet-sheet packing, which has been so successfully held up *in terrorem*, and has prevented so many from availing themselves of the benefits of your admirable system of treatment. I conclude that Sir Edward had been long enough your patient, when he wrote so feelingly, as to do so from personal experience? It has often occurred to me, when thinking of the repetitions of the wet-sheet packing practised in the reduction of fever, to ask, "Why might not the body, in many cases, if not in all, be permanently cooled down; and fever or inflammation thus *at once* checked by a lengthened affusion, or continuance in cold water, or in many folds of wet sheets lightly covered, just as you would put out a fire, or cool anything too hot?"

Dr.—As a general rule and principle, that mode of procedure would be highly dangerous, nothing more so; and no scientific practitioner would ever dream of it. The risk, nay, the certainty, in most cases, would be of its abstracting too much heat, of lowering action beyond the power of reaction, at least of determining inward congestions as formidable to deal with as the original malady. The safer plan, and in the end the plan equally efficacious, is to renew the sheet as soon, and as often, as the morbid heat re-

* "Confessions of a Water Patient," by Sir E. Bulwer Lytton, Bart. Sold by H. W. Lamb, Royal Library, Malvern.

turns in full force. This is denoted by very unequivocal signs, as suffused or flushed face, throbbing temples, quickened respiration, general malaise, &c. By this renewal of the sheet, the morbid heat of the patient is continuously, but gently drawn off—and this without running any risks of suddenly chilling the body beyond its powers of reaction. Accordingly, we find, that when the reductive packings are finished, and the patient placed in bed, the relief from the process is most sensibly felt. The exhalation from the surface which has thus been promoted, and the brisk movement of the fluids to the skin thus determined, have evidently been to *unload visceral congestion, open obstructions, to equalize the circulation, and to tranquillize the nerves.* There only now requires a *spontaneous perspiration* for the perfect relief of nature, and for the solution of the disease. In the majority of cases this is sure to follow.

P.—What are the objects of the wet-sheet packing in CHRONIC DISEASE?

DR.—It fulfils many indications, according to the varying phases of disease. If you revert to what I have said of the specific actions and effects of the packing process, you will see sufficient ground for our using the invaluable aid of the wet sheet in *chronic* maladies. We want often heat to be abstracted here too (in these diseases). We want the nerves soothed, the circulation equalized, muscles rested, fatigue removed, a movement of the fluids to be determined to the surface, interior congestions to be disgorged, the equilibrium of the fluids established, secretions and exhalations to be promoted, ill-conditioned solids broken up and eliminated, the tissues of the skin to be soaked, *its capillaries to be emptied and cleansed*, its *sentient extremities to be soothed*, and, through them, the brain to be *quieted* on the one hand, and the ganglionic system to be *roused* on the other hand. In this way the condition of the body is variously modified by the wet sheet packing, and the whole system *prepared to react* under the shallow-bath, or wet-sheet rubbing, which concludes, invariably, the operation of packing.

P.—What is the object of the shallow-bath at the conclusion of the packing processes?

DR.—It is to restore the normal action of the heart and vessels, to counteract its lowering tendency, to tonify the relaxed skin, and brace the nervous system. However depressed the pulse

may be it rouses it effectually; however dormant the nervous energies, it awakens them unmistakably.

P.—When Preissnitz saw the effects of the *sheet packing*, in the first case of fever in which he tried it, I can easily imagine his exclaiming, like Archimedes, "Eureka!"

Dr.—I can easily understand such a feeling in a natural-born doctor like Preissnitz, on making such a discovery. For a long time he only used it in *acute* cases, its great value in chronic disease only gradually dawned upon him after years of extensive practice. I was intimate, at Graefenberg, with a Captain Raven, of the Prussian Guards, who had been one of Preissnitz's first patients, when there were only *four*,—instead of as many hundreds which I found there,—and when the water-cure was in its infancy, *simple* and *rude*. This gentleman was cured of deafness, and a complication of aliments; he paid an annual visit to Graefenberg "to embrace Preissnitz," and he interested me much by detailing the gradual progress of the water-cure, and how the discovery of the application of each process was brought about. In this there was much to instruct and interest, but would take too much time to relate just now, and answer no practical purpose.

P.—You make no mention of the *depurative function* of the sheet packing, which I have heard some stress laid upon.

Dr.—The influence in question is much over estimated. The argument for the depurative action of this packing, is founded on the law of the equable diffusion of the liquids through *porous* membranes, that, in short, there is an *interchange* between the water of the sheet and the serum of the blood.

Now, I both deny the validity of the application of the law in question, and the reality of the fact alleged. The skin, I contend, on the contrary, unless when *soaked* for some hours, or unless when the cuticle is *abraded*, is not an absorbing surface, that *its function* is *purely exhalant* that it is not (unless when the cuticle is well macerated or abraded), one through which two liquids are miscible with each other. This assertion I ground on the simple anatomy of the skin. The exterior covering of the body is protected by a very dense compact texture (the epidermis), composed of minute oily scales *overlapping* each other like the scales on fish, or tiles on a roof, and quite as impervious. Now these impervious scales, or tiles, the layers of the epidermis, *are easily*

raised by the pressure of fluids from within (that is to admit their exit) but close against the entrance of matters from without. In fact, the pressure of fluids from without has only the effect of more closely sealing down this oily tiling. Through such a membrane so protected, absorption takes place, as I have said, only by strong *friction* when the cuticle is abraded, or when it is thoroughly softened by hours of maceration, as we see in the hands of the washerwoman, or in the effects of a poultice. I do not affirm that absorption may *never* take place, but that absorption does not *usually* take place; hard friction, for example, will clear this scaly barrier. It is sufficient for me to assert the natural state of the cuticle. Now, the soaking of the wet sheet never, or very rarely, is carried to the point of rendering the cuticle permeable, at least, not appreciably so, or to an extent to have any influence in diluting or modifying the serum of the blood.

Admitting that the cuticle, at all times and in all spots, were really and thoroughly porous, still the interchange in question could never take place in ordinary packings, because one of the first precautions of the process is to wring the sheet nearly as dry as possible. The moistened texture of the cloth in that case can only part with vapour, which, in that case, penetrates the meshes of the blankets, and gives but little to the skin; so that, in point of philosophy and of fact, the supposition is untenable.

I am quite alive to the part played in the phenomena of living beings, by capillary imbibition, molecular attraction, endosmose, and exosmose, &c., but they afford not the slightest countenance to this view of the action of the wet-sheet packing.

P.—Still you will, perhaps, admit, that the wet sheet is a depurating process, although not in the way you have just examined?

Dr.—Unquestionably the wet sheet is a *depurator* in the sense that all the other agents of the *water-cure* are depurators, that is, by powerfully promoting an equable circulation, opening obstructed excretory organs, enhancing the waste of matter, facilitating its elimination, and calling upon every power of the organism to substitute *pure* fluids and solids for *impure* fluids and solids.

P.—I have been told by patients, that in certain cases, after some weeks of packing, the sheet, after having been lain in about an hour, has been found sometimes quite *slimy* and *fœtid*, or of the *strangest colours*, often like the rose colour we see in a shot-silk. How do you explain these results? for I know that the

sheet is well washed and wrung every day, and the patient is well purified by enjoying at least two general ablutions daily, as well as abundant rubbing with dry sheets and towels.

Dr.—The facts you state are correct, and the explanation is not far to seek. These matters, that at critical times appear in the sheets, are the evident elimination of a *materies morbi*, retained excretions, or corporeal wasted matter, &c. The alleged slime is simply the softened scarf skin, or epithelium, which has exuded, sometimes in incredible quantities. The skin of such patients, and they are the *rarer* cases, would *pro tem.*, I admit, be likely to absorb a *small portion* of the fluids of any bath they might be placed in. But in *a well wrung packing sheet*, there is, unfortunately for the theory I have been examining for you, no free water to be absorbed.

Apropos of the power of the sheet in extracting colouring and other matters, I forgot to mention that in a desperate case of jaundice I had to treat some time ago, the sheet, after an hour's packing, was found sufficiently saturated with bile to make the many gallons of water in the shallow-bath *yellow*. My good friend and patient, Dr. Horner, who, as you know, has been in practice nearly thirty years, declared to me, in expressing his surprise at this phenomenon, that he had never seen so intense a case of *jaundice*, one in which the yellow was so general, deep, and brilliant, and the patient so completely helpless and prostrated.

P.—Verily, "there are more things 'twixt heaven and earth than we dream of in our philosophy." Did the patient recover?

Dr.—I am happy to say he did. The packing, I should observe, was but a minor part of his treatment. He had been long in India, and had gone through the *Jungle*, and several other fevers, which had left him a living wreck. Many *bones* had come away, with *all* the palate, *decayed and softened by the mercury* he had taken. His recovery from the jaundice, so complete and rapid, caused much congratulation and surprise in all his friends, who witnessed the severity of the case and its critical nature.

P.—This sheet packing seems so simple and manageable an operation, that it is a matter of no small surprise to me that it has not become a common, *every day remedy* in the hands of medical men generally, at least in the treatment of *common fever*, or indeed any marked feverish states.

Dr.—Certainly it is much to be deplored that such a remedy

should be only in the hands of a few water-doctors, for, after all, there are only some half dozen of us in the United Kingdom; and hitherto we have had chiefly to contend with old and formidable *chronic* diseases. No doubt there are many who know its priceless value in fever, who *dare not* use it; they fear their neighbours, or rivals, whose ignorance may be real, or prejudices insurmountable, and who might denounce them in their circle, as dangerous practitioners, given to "foreign innovations and reckless experiments." Moreover, if the *wet-sheet packing*, which *many mothers* now use as a safe and unfailing *domestic remedy* in many of their children's ailments—should *prove as valuable* in *fever* in *medical men's as in ladies' hands*, what might happen next? If there was a desire or doubt expressed, I would willingly go into any hospital in the kingdom, take my servants with me, and show the whole working of our system of treatment, on a sufficient number of patients to make it clear and *familiar* to all the medical officers.

P.—Some fine day I hope you will be invited.

Dr.—Then I will go.

I remember seeing in the "Provincial Medical Journal," a report of many cases of fever *treated successfully* with the wet-sheet packing, by Dr. Gill of Nottingham, an old college friend. But although the results in these cases were *highly satisfactory*, still it was evident the practitioner was not quite master of the processes. I believe this is the only instance of any public trial being given to this remedy in fever.

P.—I understand you once treated yourself in this way when attacked with fever. I should like to know your personal experience in this important matter.

Dr.—I will tell you as briefly as possible. After having been, to all appearance, well and robust for some time, I had a temporary ailment, called a crisis; in *a feverish state* I had gone early to bed, from which I was suddenly roused by cries that the house was on fire. I was at the time in the little town of Friwaldan, at the foot of Graefenberg, which was also on fire. The wind blew a gale, and the wooden roofs and houses carried on the fire like a field of reeds. The whole thing was so sudden, that I had to throw my things out of the window and hurry out also. After having been up all night, and wet through, assisting the other patients at the fire, the next day I found myself with intense headache, shiverings, and pain in the limbs. At noon I returned to bed, and *burning* fever soon set in. Being at that time in the

daily habit of packing, I commenced at once, and had the first sheet changed in little more than a quarter of an hour, the next in half an hour, in the next I remained for nearly an hour, and in the last for rather more than an hour. After this I had the shallow-bath at 80°, was well rubbed for about three minutes, and then had cold water added to 60°, and was rubbed for three minutes more. I then went to bed, the *headache* being still *very severe*. I had committed a mistake, by having in the two first packings, too many blankets and a heavy down bed, which produced great oppression and too rapid a return of fever heat. There is another great improvement in the treatment of such cases, which I wish to point out to you. I found that getting up each time to have the sheet changed was very disagreeable; this can be obviated by merely taking off all the coverings, opening the sheet, and laying a fresh piece of wrung linen over the whole front and sides of the patient, then replacing the sheet—which has now become cool by exposure—as before. This saves any disturbance of the patient, which is of very great consequence, as you will acknowledge, if ever you have a fever, or occasion to call in the aid of this *greatest of fever remedies*. In a few hours the fever returned more intensely than ever, and I was glad to re-commence the packings. The next day I had still headache and fever, and repeated the packings, early in the morning, at noon, and late in the evening. The third morning the headache was gone, and two hours after a *double packing* at five in the morning, a gentle natural perspiration broke out, which was left undisturbed until noon, when a chilled bath was taken. In the evening I was able to sit in the air, languid, but free from all pain or fever. I had all but fasted the whole time, and now felt returning appetite.

I remember, at the end of a college session, being confined to bed, for above a month, with a similar attack of fever, and in no way more severe than the one I have just described. I was attended with unremitting kindness by one of the first physicians of the day —was leeched, blistered, and had my head shaved— all of which was followed by a *long convalescence*.

P.—Your account is encouraging and satisfactory; and certainly appears very simple, safe, and effective. I should imagine it would be very fine in all the feverish ailments of children?

Dr.—It is "*a real blessing*" for mothers and their innocents. I have treated my own children always with it, and with unfailing good results. In fact, with fomentations, packings, compresses,

and a little castor oil, my wife can do and has done *nearly all* the doctoring in all their ailments; even in *convulsions* and *scarlet fever*, I have had really little trouble. In the *latter* she condescended to call me frequently in consultation, for my little girl was prostrate, and labouring under the most severe form of the accompanying sore throat. I had treated my wife with scarlet fever in the same way at Nice, in the midst of a raging epidemic there. Personal experience, you perceive, gives much confidence, but we are quite alive to real danger where it exists.

P.—I am now much satisfied with what you have told me thus far of the wet-sheet process, I shall now be glad to hear all the hints and directions you can afford me as to its proper practical administration.

Dr.—Well, I shall further add the following advices, which you will study and observe, as the dictates of experience:—

I. Too much caution and discretion cannot be observed in the use of the wet-sheet packing. It should not be administered through mere *routine*, never without a special and valid reason, drawn from an actual survey of all those circumstances in the patient's case that demand it for the moment. The skin, the presence or absence of perspiration, the pulse, the respiration, the tongue, the digestive viscera, the heart, brain, and lungs, the temperature of the *feet* and legs—all must be interrogated to ascertain whether the measure is indicated, and what *dose* of it can be borne —how far it must be carried; as well as its known and expected effects anticipated and provided for.

II. It is of consequence that the operation of packing be well performed. Negligences in this matter may mar the effects of a beneficent measure. The sheet should be of linen or calico for the delicate, of coarse linen for the strong. After being dipped in cold, chilled, or tepid water, it is wrung out thoroughly, if for a case of chronic disease, but much less completely if for the reduction of febrile excitement. The ends of the sheet should not overlap the body in front more than six or eight inches, and no superfluous wet linen should be left about the feet. The blankets should be so adjusted and tucked in as hermetically to seal up the patient from all entrance of atmospheric air. The packing about the neck should be particularly attended to, as it is at this point generally that the chief imperfection exists, and air enters, when not done by persons perfectly *au fait*. It is well to guard this part by a shawl extra, tucked well in from the back of the

head all round under the chin, or two blankets placed in a triangle next the sheet, the apex downwards. A smooth diaper or silk handkerchief laid outside of all, around the neck and chin, saves the skin of those who complain of being there fretted by the rough coverings. Four large thick blankets doubled, with a down coverlet over all, is the requirement for an ordinary packing in chronic disease. In some acute diseases, the down coverlet is dispensed with, and even a blanket or two less may suffice. Some restive patients who fidget much in the packing at first, find relief from having the arms free. This may be allowed, provided the packing be secure in other respects. The patient may be packed in the semi-recumbent posture, with the head as high as he pleases; or he may lie on his side, if necessary. The blankets and other coverings may be made to approximate nicely to the person, but *not tight;* in this the comfort of the individual should be consulted.

III. In packing to reduce feverish excitement, the frequency of the renewal of the sheets is regulated by the intensity of the symptoms. The patient remains in the packing only long enough to warm the sheet. The rule for the repetition of the sheets is *so long as the skin remains dry and hot*—say at first, every ten or fifteen minutes, then every half hour, then at longer intervals, and with better-wrung sheets, thus prolonging the duration of the packing as the morbid heat yields, and as the patient feels soothed and comforted by it, or finding it more and more *a soothing body-poultice.* When the febrile symptoms are effectually subdued, the patient remains for a considerable time in the last sheet, an hour at least, before being put in the shallow-bath, which *concludes* the series of the operations. The temperature of the bath may vary from 60° to 85°, and its duration, from two to ten minutes, cold water being added by degrees, as indicated or ordered; acting on the rule that *the lower the temperature the shorter the bath.* The patient is then well dried and put to bed. It is of great importance to change into a fresh bed, if possible; at all events, to renew the body and bed linen and blankets—to maintain the patient in *perfect quietude,* and the chamber in perfect ventilation, and always a *fire* in it, if the weather be cold and damp. All that now remains for the perfect relief of nature is a spontaneous perspiration. *This generally ensues.* If it does not, and should the feverish heat and other inflammatory symptoms re-commence and increase, then the packings must be resumed.

IV. With regard to the use of the shallow-bath, after the reduction of febrile excitement, there is this caution to give, that should perspiration ensue during the last change of sheet, this must be respected as Nature's spontaneous CRISIS, *and on no account must this salutary drain be interfered with, either by renewed packings or by the shallow-bath.* It must have free course for many hours, half a day, or even longer—in fact, till the patient begins to get weak under it, or till it diminishes or ceases altogether. If, for any reason (as for the relief of the bowels or bladder), it be necessary to disturb the patient before the perspiration has ceased, all risks of chill or exposure must be carefully avoided. The *necessary* conveniences may be introduced without uncovering the patient. Otherwise if he be obliged to leave his envelopments, there is no alternative but that he must have the shallow-bath, but always, in such a case, *comfortably warm* and gradually *cooled down.*

V. The wet-sheet packing being the *sedative* and *antiphlogistic par excellence,* it is an indispensable and invaluable remedy in the *active* or *incipient* stage of all acute diseases, fevers, inflammations, &c. The febrile symptoms may be those accompanying inflammations of the stomach, lungs, or brain, &c., the fever of acute rheumatism or of small-pox. Measles, scarlatina, or it may be fever without any *appreciable* local lesion (idiopathic). The wet-sheet packing, managed and restricted as I have described, is not only a *safe* process, but the best ever discovered, *wherever the pulse is decidedly above the natural standard and the skin dry and burning.*

VI. *The wet-sheet packing is improper in fever, when the pulse is feeble or slow; when the skin is cold, or bathed in clammy perspiration; or when the signs of great debility are present; in short, wherever there are severe typhoid symptoms.*

VII. An ablution for two or three minutes in the chilled or cold shallow-bath is an indispensable sequel of the wet-sheet packing in chronic as well as in acute diseases.

VIII. If, in the packing, symptoms of oppression of the head occur, which is sometimes the case on the return of the morbid heat, or when perspiration is about to show itself, it is requisite to apply wet compresses to the head. To avoid, however, all risk, even in this shape of interference with any critical effort of nature, the compress must be more *thoroughly wrung out,* and less frequently renewed, than under any other circumstances would be proper.

IX. There is a grave error—a perversion of the ends and implements of the water-cure—committed by many patients and inexperienced practitioners, in packing, so much as they do, delicate and debilitated patients, labouring under *chronic diseases*—diseases that have *impaired* the *blood-making*, *blood-purifying*, and *blood-moving functions* so thoroughly, that the whole mass of the solids and fluids is corrupt, the whole vital powers prostrate. I have seen many such patients, undoubtedly, *in the long run*, recover, not in consequence, certainly, of the packing, but by pure force of the excellency of the water-cure regimen and appliances in other respects. For such patients the packing should be a very remote measure of treatment, except where there are *feverish* symptoms, or unless *artificial means* are used to *enhance before hand* in a high degree the vigour and activity of the circulation, even then the packing should be *partial*.

In rare cases, the lamp-bath may be used to the *point* of perspiration, or, better still, the patient may lie and be well rubbed in a bath of 96° to105°, for five or ten minutes and well *dried quickly* in *a warm sheet*, and then at once packed in thin linen or calico to the knees. Reaction then is sure to ensue and speedily, and after half or three quarters of an hour of this clean poulticing, the patient is in an *unfeverish warmth*, sufficient to react and benefit by all the bracing and tonic effect of the ablutions in the shallow-bath, *which must not be long*.

But, as usually administered, the vitality of such patients is far too feeble to supply the heat called for, and the measure goes far to depress many patients, and make them irritable and dissatisfied with the water-cure at the first, as a thing ungenial to the *warm* instincts of an invalid who shivers before every breeze. Such a harsh and repulsive initiation into the system is not necessary, neither is it advisable or scientific, when the vital processes are so disordered, the vital viscera so congested, or so inert, the reactive powers so low, and the constitutional stamina *débile* and exhausted; directer, speedier, and more congenial means—means better tolerated and more effectual, are at hand for the resuscitation of such prostrate patients. Such patients want *heat added*, not abstracted, unless when it has been supplied above measure, where they can spare it, and when the very parting with it is productive of the most invigorating impression the animal system can receive. But of this anon.

Notwithstanding what I have said, I am free to admit that cases

do occur occasionally among the debilitated subjects in question; for example, in some cutaneous diseases, or in feverish states, where the wet-sheet packing is indicated. For such, where the previous heating process I have described is not used, a *partial* packing is sufficient to begin with. A yard of thin calico is laid over the trunk of the body, and the packing proceeded with as usual. In a week or so, or as soon as the patient can warm this well, place another piece of calico under the back. By gradually increasing it in this way, the patient will soon bear the wet envelopment to the knees; and so remarkably, in general, do the vital energies rally and augment under the treatment, that tolerance of the full sheet is often in no long time established.

X. In *all* cases where the *feet remain cold* in the wet-sheet packing, they must be *left out* of the sheet. Warm woollen stockings must be kept on, or the feet and legs wrapped in warm flannels, and perhaps a *hot bottle* or *brick* used in addition. The best plan, however, is to have the feet well warmed *previously*, either by exercise, by friction, or by *five* minutes' immersion to the calf of the legs in water as hot as it can be comfortably borne.

XI. Particular parts of the body, as the chest in nervous asthma, or the region of the heart in nervous palpitations, sometimes require at first to be protected from the direct contact of the sheet. But in all inflammatory diseases the wet-sheet, or the steaming flannel, must be in contact with the surface of the chest.

In some cases great benefit is experienced by the direct application of warmth and moisture to certain parts, as the throat, stomach, liver, or chest, *during* the sheet packing. This is effected by wringing half yards of flannel out of hot water, and placing them on the part affected, before the envelopment, and renewed from time to time if necessary, by giving the patient room to use his hand under his coverings.

XII. The precise time of lying in the wet sheet (in chronic diseases, of course) varies with the specific constitutional powers of each patient, the seat, nature, and stage of the disease, and the season of the year. As a general rule, *never unpack till the patient is thoroughly warm*, this being the great condition of reaction, whether in the shallow-bath *after* the sheet, or in the sheet, on first lying down in it. This is the foundation of the next rule.

XIII. *Never pack a patient who is in a chilly state.* When the operation is inoperative on account of the ulterior ends to be

gained, and for the purpose of faithfully carrying out a more general plan of treatment, then every justifiable expedient must be used *to get up the heat* previously. Of these means there are several. On account of the accumulated heat of most people after a comfortable night's repose in a warm bed, an hour before rising time has always been a favourable time for the performance of packing. The forenoon also, after exercise, is, in many cases, an excellent time. The *repose* of three quarters of an hour in the sheet, from a quarter to twelve until half-past, often starts the day anew, reviving the pristine freshness and mental sunshine of the early water patient.

XIV. Patients must not remain too long in the wet-sheet packing, half or three quarters of an hour is a good *average*—one hour the outside; but, of course, there are cases wherein long packings are desirable.

XV. I frequently order, what I call the *double packing*, in cases where there is inveterate, or deep-seated irritation, which we often find in sufficiently robust subjects to bear the process. Great relief and benefit are obtained by it. As soon as the patient is well established, warmed, and comfortable in the *first* sheet, say in thirty or thirty-five minutes, then let the packing be repeated with a fresh wrung sheet for an additional thirty-five minutes, or longer if necessary. In some cases it is well to undo the packing, and to apply quickly a piece of fresh well wrung linen, without disturbing the patient, as I have mentioned relatively to the treatment of fever. You will often hear the patient express satisfaction, by enjoying all the peculiarly soothing pleasure of the packing in the *second* sheet, when unobserved in the *first*.

P.—You had something more to say about *convulsions* and *scarlet fever?*

Dr.—True, much more; but I shall now merely add, that in scarlet fever, as soon as the first symptoms of sore throat show themselves, I take care that the throat is well fomented with steaming flannels for an hour or more at a time, and repeated every two or three hours. In the intervals a *lighter* piece of flannel, wrung out of hot water, is applied to the throat, covered with a piece of oiled silk or light Mackintosh, and over this some dry flannel. All to be, mind you, *light*, *warm*, *moist*, *comfortable*, *impervious*, and *unoppressive*. Never, upon any account, apply a cold compress to the throat in such a case. The treatment of a common gastric sore throat is quite another thing, then you may apply the

cold compress, well covered, going to bed, preceded or not by fomentation; and the probability is, that in the morning you will find the sore throat cured.

As regards convulsions in children,—during many years that I passed in a large private practice in London, as an *accoucheur* also, the treatment of children came necessarily much under my care and notice; I can now recall *many fatal cases* of convulsions, where I had the best assistance, and where all the most approved means were used. I believe I should have lost my own child in convulsions, but for this packing and its adjuncts; I believe, moreover, humanly speaking, that the majority of the fatal cases I have mentioned might have been saved by the same simple means.

XVI. Young children may be packed on the nurse's knees, with a piece of linen extending from the feet upwards and passed under the arm pits, leaving the arms free, and thus avoiding any feeling of restraint—two or three pieces of flannel a yard and half square, and a blanket doubled, suffice for to make them warm. Children sleep almost immediately in the packing; its *soothing* and *sedative* effects in young subjects are so very remarkable that they might almost be said to be without exception.

The bath for very young children when taken out of the packing, may always be warm, from 85° to 95°, then cooled down at two or three intervals to 65° or 70°, according to circumstances. In some cases of convulsions, it is necessary to prolong the rubbing in the bath for ten or even fifteen minutes, within the range of temperature I have mentioned. This is necessary when there are symptoms threatening any severe return of the convulsions, and notwithstanding that they may have been quite arrested during the packing. The practitioner by feeling in the child's *armpit*, will be guided by the heat there, for as long as there is warmth he will know how far he may carry the sedative effects of the bath, so as to produce the desired result, and at the same time to ensure a *slow* but *steady* reaction. In many cases the addition of fomentation of the whole abdomen for three quarters of an hour, twice or three times a day, an hour or two, or in some cases soon after packing, produces marked tranquillizing effects on the child. If there is reason to suspect that there is any acidity, or irritating undigested matters in the stomach or alimentary canal, it is a necessary precaution at once to administer a gentle aperient—either castor oil, in a little warm milk and sugar, which make it tasteless—or rhubarb and magnesia.

The *stomach compress*, or abdominal linen poultice, is an application as valuable as it is simple, combined with other remedies, in the treatment of the maladies of children, where there are symptoms of local or constitutional irritation. It is in fact, a minor but more prolonged packing. Of this remedy we will converse presently.

P.—From what I have felt and experienced myself of the sheet-packing, under a variety of circumstances, I understand, and quite appreciate all you have been inculcating; I feel with you, that it would be indeed "a real blessing to mothers," and I sincerely hope you will live to hear the word *packing* as "familiar in their mouths as HOUSEHOLD WORDS."

DR.—I like your sentiment; may it be as we desire. Be assured, good patient, that in trying times of sickness, when the parent is tossed in mind by anxious doubts, with her maternal solicitude drifting mournfully on the current of painful thoughts, she will ever find this a sheet-anchor to lean upon, supported by hope and cheering confidence; for here we have remedial art with her handmaid experience, resting on the firm basis of science and certainty, of *cause* and *effect*—all lending their countenance to encourage a rational anticipation of success, and their willing aid to secure a happy result.

CONVERSATION CVI.

OF COMPRESSES AND WET BANDAGES, THE COOLING AND THE HEATING, THE SEDATIVE AND THE STIMULANT; IN OTHER WORDS, THE LINEN POULTICES AND THE WATER RUBEFACIENT OR PAINLESS BLISTER.

DOCTOR.—I WILL now give you a brief account, but sufficient I trust, to make you understand the water dressings, which are amongst the great practical discoveries of the healing art.

PATIENT.—I have read in some of your old books, that it was by a similar mode of using water—with the addition of some absurd form of incantation, to which all the good effects were

ascribed—that persons in past ages performed cures so remarkable, as to gain for them the appellation of "miraculous."

DR.—Yes; in those days there were MYSTERY MEN, who really did perform wonderful cures with "*charmed*" and "*blessed water.*" Some of them, more material in their leanings, dropped a "*secret powder*" into the water, but only as much as could be taken up on the point of a pin, *so potent was it supposed to be.*

Ambrose Paré, who was a man of the greatest talent in the age in which he lived, refused *for some time* to apply water to wounds, as the curative effects seemed to him so extraordinary, that they could only be produced by supernatural agency, which, from religious scruples, he did not consider it justifiable to employ.* It

* During the siege of Metz, in 1553, an ignorant quack called Maitre Doublet, as Brantome relates, "performed strange cures with simple white linen, and clean water from the fountains or wells. But he was assisted by sorcery and charmed words, and every one went to him, as if he were Maitre Ambrose Paré himself, a man so celebrated and considered the first of his day."

Ambrose Paré, who equally detested fraud and folly, in writing his report of the "Proceedings of the Medical Department of the Army," speaks thus: "I do not deny that water is a good remedy in wounds and recent injuries, having employed it myself with much advantage, but I object to the mysterious words, and the vain and unchristian ceremonies, that accompany this new and singular practice, which is so simple, that it requires no aid."

"The Book on Surgery," by Gabriel Fallopius, published in 1560, strongly recommends the use of natural water as a "fruitful source of success."

Laurent Joubert in his work on "Popular Errors," published in 1578, exposed the folly of using charmed water; and described common water as being most efficacious in procuring "a favourable termination and a good cicatrix."

In 1732 Samorier published "On the Use of Common Water in Surgery." He asserted that there were few wounds which could not be healed by this treatment, more promptly and satisfactorily than by any other means.

In 1785, a number of men were severely wounded in proving the cannon at Strasbourg; a miller of Alsace undertook their cure, by the leave of the Intendant of the province, with *blessed water;* these wounds were all cicatrized in six weeks. A second proving of the cannon wounded thirty-four men. They were dressed with common water by Lombard, the surgeon-in-chief, by which means they were all cured. The progress of the wounds was witnessed by Baron Percy, then a surgeon-major of cavalry. The success on this occasion produced a pamphlet from Lombard, in 1786, "*On the Properties of Simple Water as a topical application in the Cure of Surgical Diseases.*"

Baron Percy always afterwards employed *warm* or *cold* water, according to the season. He says they often had from 6 to 8,000 wounded in their hospitals. His experience, therefore, cannot be questioned, and so strong was his conviction of the utility of this treatment, that he said "*he would relinquish military surgery if he were prohibited from using water.*"

is said, that even Priessnitz at one time, was obliged to make the sign of the cross over the water, to show that there was no "*Satanic influence*" used in effecting such extraordinary cures by such simple means.

P.—If Priessnitz had been a man who could have made use of a *secret powder*, say as much as would go through the eye of a needle, to be put into each bath, and had transmitted the secret through faithful followers, with like secretiveness, I have a notion that by this time, you would have had all the world, and many of its doctors too, running after the water-cure, and crying out for the marvellous powders.

Dr.—Probably. I shall now begin by directing your attention to the abdominal compress or bandage, which is applied to the abdomen, as a warm fomentation, and worn more or less, in the treatment of nearly all chronic diseases, where there is morbid action going on in the stomach and bowels, liver or kidneys.

P.—The application of wet linen to *this region*, above all others, and to be worn more or less regularly, appears to me a very remarkable idea to have entered into the head of a man like Priessnitz, granting the supposition that he had neither anatomical, physiological, nor pathological knowledge.

Dr.—It is so; and more particularly when we find that it was a highly physiological proceeding, applying his poultice to the right place, and to the *fons malorum* in the majority of cases of chronic disease. It is used in the following way:—A bandage sufficiently broad to reach from an inch above the pit of the stomach to an inch or two below the navel, and long enough to meet when passed round the abdomen, is wrung well out of cold water; this is applied comfortably tight, and another circle or two of *dry* linen continued over it. This we called "Neptune's girdle." I wore it in this form at Graefenberg, but finding some discomfort in having the wet application on the loins, I contrived a linen belt, with four strings, having the *wet part* or compress separate, covering the *anterior part*, and extending only half or three quarters round, as I have mentioned in my *first* work on the water-cure. This answers every purpose in most cases, and the wetted part can be extended over the kidneys when required. This linen belt can be taken off and replaced more easily than the long bandage, and it admits the convenience of placing oiled silk, or a fold or *two* of flannel *over* the moveable piece of wet linen. I find the *dry* flannel particularly useful where additional *warmth* and not heat is re-

quired, it has also the advantage of absorbing the vapour, and preventing the dry linen belt from becoming damp.

P.—I have heard much of these heating and cooling compresses. Will you explain to me the difference between them?

Dr.—With much pleasure, for I find that the prevailing ideas of the nature and action of compresses amongst persons who come here, are exceedingly vague and confused. I shall re-examine the subject, and attempt at least to make it clear and comprehensible to you.

The division I make of compresses, is into the *emollient* or *soothing* compress, or the simple *linen poultice*, the *water dressing* of Macartney adopted by English surgeons. Next, the *rubefacient* or gentle *derivative*—composed of linen thoroughly wrung, so as barely to suffice to keep the epidermis soft for a time, and closely applied to the surface of the skin, so as to burrow, as it were, in the delicate textures, to irritate them, which irritation shows itself in an erythematous blush, and sometimes a pustular, or vesicular eruption. Lastly, the *sedative*, or powerfully derivative compress. In this the linen is well soaked, and is constantly renewed before it gets too warm, so as to prevent reaction in the part, and accomplish the purposes of *sedation*, where we have to deal with a high state of irritation or acute inflammation.

The alleged *heating* or *stimulant* effects are *relative*, not absolute characteristics. The compress may be made very *cooling* by the slightest modification. Indeed, it is always *cooling at first*, and only becomes heating and stimulant according as it is covered, and in proportion as the water evaporates with which the linen is impregnated. To make it permanently *soothing* and *healing*, it is only necessary to moisten the linen more thoroughly, and to prevent evaporation, as is done by an impervious covering, as of oiled silk. This constitutes the *water dressing* of the hospitals, and is in fact, the best sort of *poultice*—the sweetest, the cleanest, the least messing and troublesome. It consists simply of several folds of linen, or lint, dipped in water and slightly expressed, if simply for *a poultice*, in which case, it must be covered with oiled silk to prevent evaporation. But if the object of the compress be *derivation*, and to act as *a rubefacient*, then it is thoroughly wrung out. This is applied as smoothly and closely as possible to the skin, and care is taken to cover it with several folds of dry linen. This prevents all possibility of air getting in, and so lowering the temperature of the spot. The surface of the part bandaged, in

fact, for the time being—in the case of the *poultice*, for instance—is placed in a local vapour bath, and in the other case, the effect is the same in due time as if a rubefacient blister or very gentle escharotic had been applied, making the part very red, without pain.

P.—This is all very interesting, and will be more so when you have told me the physiological and therapeutic effects.

Dr.—They vary according as the compress has been used as a simple *poultice*, a simple *rubefacient*, or a simple *sedative*. The last I might omit, I believe, for it has nearly the effect of any local bath, as the sitz or foot-bath; and, I dare say, you now so thoroughly understand the action of such, that their repetition is here unnecessary. With regard to the simple *poultice* compress, and the *rubefacient* compress, they have certain qualities in common. For example, the rubefacient compress when first refreshed, and until it begins to get dry or over-heated, is a poultice. They both in common produce softening of the epidermis. They in common effect also maceration of the true skin beneath, and the dispersion or *absorption* of any extra-vascular, or superfluous fluids, contained in the tissues of the part. Hence, morbid tension and swelling are reduced by such applications, as one of their most obvious results. But an effect of the *rubefacient* compress, not yet sufficiently appreciated, I have still to mention, which is, that the intimate adhesion of the comparatively rough texture of the drying cloth to the exposed and softened vasculo-nervous web of the skin, irritates and inflames it to a certain point. That the red suffusion or *blush* on a part whereon a compress is constantly worn, is *in some measure* owing to the irritating effect of the texture of the linen, is evident from the fact, that the irritation is the livelier as it dries, and that the irritation is appeased for a time by remoistening the compress. The wet compress here acts the part of the mildest escharotic or rubefacient; in fact is *a painless blister*, a diffused *seton*, only one that has *not* disorganized the tissues of the skin.

P.—And so the wet compress is, in this view, a physiological curative agent, not a *pathological* one, as anything that produces artificial disorganization of the tissues and suppuration must be. This alone speaks much in favour of your methods.

Dr.—You justly appreciate its superiority, and the grounds of it, in some measure. But to continue—the *rubefacient* action of the heating compress being admitted, how powerful a revulsive agent it thereby becomes is a clear matter of course. You have

produced and *keep up*, and this too without pain, the effects of a blister or mustard plaster—troublesome rubefacients, and *comparatively evanescent* in their action. The energetic cutaneous actions which are produced by the rubefacient compress, are evident in the increased heat of the part, which always stands some degrees above the natural temperature. To develope this heat, you already know, that increased chemico-vital acts are necessary; and for these last, in turn, an increased circulation is necessary. Hence the revulsive action is clear. But as the heat is not allowed to escape *directly*—is not drawn off (as in the cold or chilled bath) as rapidly as it is evolved, the derivative action to the surface is by so much the more gentle. Besides, the state of the skin so produced is favourable to its action as an eliminating organ. The proofs of the *outlet* thereby of *morbid matters* are often apparent to the senses of *sight* and *smell*.

In some patients this state of matters is produced *quickly*, in others it is more *remote*, the difference depending upon a critical tendency and a variety of *local* and *constitutional causes*. In some, the *external* effects are barely appreciable; in others, *the redness soon appears formidable*, without being so in reality.

P.—I see now the reason of the frequent prescription of the abdominal heating compresses in derangements of the digestive viscera. Their clearly established revulsive action must be an immense relief to the irritated or congested organs covered by the compress. It is a perpetual blister to them, of the gentlest kind, *a blister that gives no pain!*

Dr.—You are quite right, it is a *painless* blister. For the reason you allege this compress is worn in most cases of derangement of the digestive viscera (which is at the root of the evil in a great many chronic diseases), in all irregularities of the bowels, constipation, diarrhœa, spasms, &c. The chest compress is worn in like manner in many cases of chronic diseases of the lungs, air passages, and heart.

P.—But do you not think it probable that when worn very long the compress loses its peculiar irritant action on the skin, and therefore its utility as a *revulsive?*

Dr.—In some cases undoubtedly it does, to a certain extent. The indication of their doing good in one way, as of their continuing to exercise an active revulsive power, is seen in the red (erythematous) state of the surface, and the vesicular and pustular eruptions in many cases. So long as this effect continues, they

cannot be said to be inoperative. You must also bear in mind, that, although the skin *shows it not*, the compress still acts powerfully on the organs and nervous apparatus beneath.

P.—The cases wherein you specially apply the *derivative* compress, we have just spoken of, is in most chronic diseases of the abdominal viscera, I suppose you also employ them to the chest, in chronic, pulmonary, and heart diseases?

Dr.—Yes; but with much more caution. A patient may, without prescription, venture to wear an abdominal compress. But no patient should be so foolhardy as to attempt the chest compress without special advice and experienced surveillance.

P.—In what local ailments is your *emollient* compress, or linen poultice, most frequently used?

Dr.—It is in general use as a dressing for all sorts of critical eruptions, whether in the state of simple inflammation or suppuration, for ulcers, wounds, and bruises, of all sorts; for gouty and rheumatic joints; and wherever there is pain, tenderness, swelling, or disturbance of the functions of a part.

P.—But I suppose this local medication must always be combined with general or constitutional measures?

Dr.—Always, except in purely local injuries; otherwise we merely dabble and dally in these efforts to purify the streams, instead of going direct to cleanse the fountain-head.

P.—Well; now will you talk to me of your cooling compresses, and of the purposes to which you apply them?

Dr.—The cold compress is linen soaked, without much wringing. It is changed often so as to operate a constant abstraction of heat, and in this way to keep down inflammatory action in the locality whereon such compress is applied, or in a neighbouring part which receives its blood from that locality. With this object they are applied to inflamed parts, painful wounds, sores, and swellings. For example, in some cases of painful sore of the hand, as a boil, a cold compress is applied as far up as the elbow, and frequently renewed. This operates a diversion of the current of blood going to the hand, concentrates the chief activity of the circulation in the neighbourhood of the elbow, and at the same time cools what blood does go to the hand. In this way, inflammation of the suffering part is kept down, and the healing process best promoted. It also *prevents enlargement* of the *glands* in the arm-pits or the groin, by preventing irritation of the lymphatics in their course.

P.—In what cases are they applied most generally?

Dr.—They are applied in all *simple* inflammations of superficial parts of the body—as inflammations produced by external injuries, and in boils and eruptions on the extremities. But mark this—when inflammation of the vital viscera exists—(*inflammation from interior or constitutional causes, and not the result of accidental mechanical violence*)—*cold* compresses ought never to be applied. For then they will be likely to determine such congestions, or transference of the inflammation to the tissues adjacent to those already implicated, as will interfere with the chances of recovery.

In all cases where parts are suffering from *sprain*, or from being *bruised*, *begin* with hot fomentations, until perfect ease is obtained, then apply a compress, *well covered*, wrung out of cold or hot water.

P.—It has occurred to me that your *derivative* compress has a great advantage in being worn when the patient is taking exercise, which one could hardly do with a poultice, mustard plaster, or blister. I have often found that I could walk twice as far with my compress on, and with half the amount of fatigue.

Dr.—I often made the same observation during a year that I wore it almost constantly. As I have mentioned before, it is an excellent *domestic remedy*, to be put on at *intervals*, when "the stomach is out of order." Some patients find it assists the bowels in a remarkable manner, others that it assists in producing refreshing sleep. Its peculiar effects relative to individuals is soon discovered, and it is worn accordingly. It ought to be refreshed every four hours, sometimes oftener. As a general rule, when under regular treatment, the patient may put it on half an hour after breakfast until dinner-time, refreshing it at noon. Again, half an hour after dinner until 5½ P.M., when it must be refreshed, and replaced until tea-time. When the compress is prescribed to be worn during the night, it is well in some cases to apply it an hour or so before bed-time, and not to make further change. I have occasionally found, and have heard others make the remark, that by refreshing the compress before lying down, it prevented sleep for some time. At other times, when sleepless, it acts quickly as an agreeable opiate, when applied fresh during the night. It is a remedy easily managed, and on the whole an agreeable one. I had some additional remarks to make on its surgical application which I must defer to another occasion.

OF FOMENTATIONS

AND THE BEST MODE OF APPLYING THEM.

CONVERSATION CVII.

Its soothing and derivative effects—Its restorative and stimulant influence on the great centre of ganglionic life—A revulsive, rubefacient, and anodyne—Herbæ pro fotu no longer needed—Importance of changing the steaming flannels frequently—A valuable domestic remedy, and adjunct to other remedies—Rules for its application—A process not known to Priessnitz—His early death—How to apply fomentations—My fomenting machine.

PATIENT.—FROM what you have already told me of the effects of the local application of *warmth* and *moisture*, your fomentation process sounds like a peculiarly comforting part of the water-cure treatment. I suppose it is a modification of the action of the soothing compress or linen poultice?

DOCTOR.—It is; and moreover it should be called the *ne plus ultra* of poulticing, for *soothing* and *derivation* are thus most perfectly obtained, and in the greatest degree. Each operation has, on deep-seated chronic irritations, as one of its qualities, the advantageous effects of a mild blister or mustard plaster, without any of their drawbacks: and in acute inflammations, in all nervous or neuralgic pains, in the sufferings of colic, biliousness, or sickness, or relaxation of the bowels, or other digestive derangements from dietetic errors, and in the *malaise* ushering in fevers and inflammations, in sore throat, &c., or affections of the lungs and air-tubes, it is then found to be the most agreeable and potent anodyne, and equalizer of the circulation. In fact, many acute maladies, if sedulously treated in the beginning with hot fomentations, would be cut short, or prevented running a serious course.

P.—*Derivation*, again, I see, is the *rationale* or *foundation* of the wonderful curative power of fomentations.

DR.—It is so. Strong derivation *again* from the interior to the exterior, from the *mucous* surfaces especially to the *cutaneous* surface, is an evident, and one of the leading, effects of its action. Nothing aids more promptly in unloading obstructions of the *primæ viæ* and visceral congestions, which lie at the foundation of most chronic diseases.

At the same time it is necessary that I should keep in your view, and not allow you to underrate the *anodyne* effect on the *animal nervous centres*, of so grateful a process as hot fomentations on a large extent of sentient surface, on a region previously the seat perhaps of the most distressing sensations. The reactions of the *tranquillized brain* upon the organic apparatus in turn, is a prominent feature in the *modus operandi* of fomentations that must not be omitted. Here we have the most *salutary* operation of opiates accomplished, and this without any risk of narcotism or poisoning.

P.—No small advantage certainly on the side of the water-cure *opiate* compared with the medicinal. Yet I must say that nothing can be more charming than the current of disinterested feelings, the easy flow of gilded thoughts, and the dreamy, muzzy effects produced, for instance, by the *meconite of morphia*, when it agrees. I have heard that you do administer it on occasion.

Dr.—Yes, when necessity joins with compulsion; for, remember, that I have to bear in mind, in giving my patient *morphia*, in an extreme case, to lull pain and procure sleep,—that it also *congests the liver*, that the next day *most probably* there will be *sickness* and *atony of the stomach*, inveterate *constipation*, and in many cases all but *paralysis* of the *bladder* and *lower bowels*.

P.—I am beginning to perceive clearly many of the *weighty objections* that must occur to the mind of the reflecting and observant practitioner, *when meditating his mixture of drugs*. Indeed I can hardly see how these conflicting thoughts and grave objections could long be put aside, or how the latter could escape the observation of any—except a *routinier*, as deficient in the natural faculties of perception, or the ordinary powers of appreciation, as obtuse to human sympathy and feeling, or indifferent to sinister consequences.

Dr.—I must now particularly call your attention to a marked effect of the hot fomentations to the abdomen, in the stimulation they afford to the *great centre of ganglionic life* at the epigastrium or stomach-pit. This sometimes appears to amount to the communication of so much fresh vitality to the system, especially to the *organic apparatus*, which is directly under the control of the ganglionic nerves. The amount and extent of relief to suffering organs conveyed by the fomentations, will present itself clearly to your mind when you consider the important viscera in the midst of which *the ganglionic nervous masses lie buried*, and which are

all necessarily comprehended in the action of the fomentation. Here we have the stomach and duodenum, the liver and spleen, the folds of the small and large intestines, the uterus, kidneys, &c. All or any of these organs, no matter how suffering previously, are now solaced, and partake of the combined soothing and derivative effect of this simple and invaluable remedy. No nervous irritations, no visceral congestions, especially if of recent formation, but are soon relieved by this powerful *revulsive, rubefacient*, and *anodyne*. With the dissipation of those interior congestions comes the solution of pains and spasms,—and flatulence which may have risen to a severe state of suffering,—the release of bilious and nervous headaches, neuralgic pains, asthmatic fits, of vomitings or purging. These have all their origin, near or remote, in visceral obstructions, congestions, &c.

These fomentations are valuable adjuncts to many medicinal administrations, and they have this advantage, too, that there can be no prejudice to get over or contend with in adopting their more frequent use.

In most cases, where for a longer or shorter time any organic action has been embarrassed, sleep banished or disquieted, and the patient irritated and exhausted to the last degree,—by aid of the fomentations, in a brief time, *organic calm* takes the place of *organic tumult*, ease succeeds to agitation, and the whole apparatus feels to work normally and with renewed alacrity. What I have just described, you may frequently hear repeated, and descanted upon in the same strain, by my patients.

During several years that I wandered over Europe, out of health and harness, and before my good fortune made me acquainted with the water-cure, this fomentation was my unfailing panacea. I have no doubt that during that long period (with the aid of dieting), it mainly helped to keep the morbid processes in check; and often since—in my life as a "water-doctor" at Malvern, since 1842, which although prosperous, has been as *you* know, *no sinecure*—I have found an hour's fomentation arrest distressing symptoms of fatigue and irritation, that, if not relieved, might have led to prolonged illness, or inconvenient indisposition.

P.—It occurs to me that I have heard of bags of heated salt, bran, hops, oats, and other matters, being often applied to the stomach, chest, loins, and other parts, with a similar idea I should imagine to that with which you use your fomentations.

Dr.—Yes, and *very good* they are in their *way, in certain*

cases, but not to be compared, as a general remedial operation, to the steaming flannels well managed. Many think that the peculiar virtue is in the heated article, and use it more willingly and confidently on that account; added to which, the bag once placed and not removed, causes less trouble than a mismanged fomentation, and does not wet the bed or the patient.

P.—The "*herbæ pro fotu*" are as old as the hills. I dare say you have often ordered camomile flowers and poppy heads for fomentations?

Dr.—Yes; five and twenty years ago I used fomenting herbs in the water out of which the flannel was wrung; but in the water-cure treatment the *faire semblant*, or make-believe, is done away with. The heat and moisture of the steaming flannels, we teach, are the true remedial influences. In the bags you mentioned, whether their contents be moist or dry, the wrung flannels have every advantage. Their *renewal* every five or ten minutes is an *important consideration*, for each time they are applied it is like a *fresh* poultice,—*a warm douche* to the part, that sends *agreeable* and *vivifying sensations* through the stomach, which seems, as the patient will tell you, to pervade the spinal marrow and ascend to the brain. When I first introduced these fomentations into the practice of the water-cure, I was told by some enthusiastic admirers of Priessnitz, that it was a fatal and unpardonable innovation. In relating what comfort and immense relief my wife expressed from the effects of the hot fomentations to the throat and abdomen, *directly after* the water-cure processes, during an attack of *scarlet fever* at Nice, they replied, "That is not the *cold* water-cure!" to which I readily assented.

P.—I see you have prejudices and jealousies amongst yourselves, as well as in the ranks of your *declared opponents* of the *exclusive* and *unmitigated* drug persuasion. I suppose you are not so *insouciant* as not to know the interesting fact, that you *have acknowledged opponents?*

Dr.—With my professional engagements and private meditations, what time have I to give to opponents? In truth, I utterly forget their existence, except when reminded of them and other misfortunes by a friend like yourself. How often may a man say, with a sigh, "Save me from my friends!" As regards your first remark, no doubt we have our miserable petty jealousies, heart-burnings, envy, hatred, and malice, like the rest of humanity. It is said that the medical profession is notorious for having more

than its share of these tormenting sentiments—"*a jealousy known only on the stage*"—hence the want of *esprit de corps*, so much needed; hence the oppression and advantage taken of medical men in public offices, which forms a subject of such just and frequent complaint in the medical journals. But do not suppose that our profession has any *monopoly* of the *forbidden* and *unphilosophical* feelings I have just mentioned.

P.—Well, such is human nature!

Dr.—We must take Human Nature as it is—and have we not cause to be thankful!—for what a fund of good, what endurance, what forbearance and long-suffering it possesses, what sacrifices it can make! The great human Heart, with all its responding sympathies, will never cease to beat. It is, therefore, worth coaxing, cultivating, and reasoning with, for in due time, prejudices—*our own as well as others*—will give away, and the love of truth, and seeds of good, planted so freely by Providence in the breast of every man, will flourish, grow, flower, and fructify.

P.—I shall be glad now to hear any further instructions with which you may favour me, for I intend indoctrinating my wife thoroughly in all matters relating to the water-cure, beginning with compresses and fomentations for the children. She is a lady with a warm heart and warm instincts, and I have no doubt will take kindly to what I call your particularly comforting processes; the rest will follow, although as yet greatly prejudiced, and dreading your "*damp-sheets*" and *cold* ablutions.

Dr.—You will do well and wisely. If once tried they will never be abandoned, for she will find the fomentations a valuable *domestic remedy*, either for an infant or an octogenarian, for her baby or her grandfather. You understand clearly from what I have told you, that the fomentations fulfil indications, that nothing else will do so *surely*, *innocently*, and *promptly*, besides being *a valuable adjunct* to so many other remedies.

I will now make a few passing remarks for your guidance, and end by explaining the best mode of using the flannels, and also describe my *fomenting machine*, which only requires to be known to be prized. I modestly think the *inventor deserves* to be immortalized—whether he be or not.

P.—If I know you well, I think you value your *machine* and the soothing *fomenting flannels* much more than any mortal "*immortality*" to be obtained in this *mortal* world.

Dr.—Sie haben recht. I believe I forgot to mention that in cases

where there is *inveterate low spirits*, and in the most deplorable forms of hypochondriasis—whose seat is incontestably in the *ganglionic centres*—these hot fomentations are of pre-eminent utility.

Now to give you a few of the promised rules:—

In the *first* place, in the performance of this process, use every care to protect the patient against all risks of taking cold, when the hot flannels are renewed. Needless delays, open doors, windows, and draughts, must be guarded against.

2. The temperature of fomentations is of great importance. To be *strongly derivative*, to be *rapidly rubefacient*, they must be as hot as they can be *comfortably* borne. This is required, for example, where there is intense irritation, or the *very commencement* of an inflammatory affection, as of the throat or larynx, of the lungs, stomach, bowels, bladder, or womb.

3. In cases where the irritation to be subdued is chiefly *nervous*, the object being then more to *soothe* than to *revulse*, the fomentation must be only comfortably warm.

4. In all fomentations, take care that the simply nervous irritation of the skin be not roused; for this exceeds the healthy point of *ganglionic stimulation* on the one hand, and is known by its unduly exciting the action of the heart and arteries; and, on the other hand, it unduly stimulates the *animal nervous centres*. In this double way, the process, instead of being soothing becomes exciting. This morbid effect is apt to occur on the subsidence of the internal irritation, against which the fomentations have been employed. The passing of the due point of the salutary action of fomentation, is indicated by their producing palpitations, tendency to headache, *malaise*, restlessness.

5. The effect of fomentations, therefore, must be well watched, and their abuse or morbid action guarded against. When they have done their work, when they have reduced irritation, they must be discontinued.

6. In the reduction of inflammatory action, when the pulse has lost its sharp jerky character, the hot fomentations may be discontinued. Their prolonged use, under these circumstances, would render it small, weak, and irritable.

7. Wherever the vital powers have been *temporarily* lowered, as by the *shock* of a severe fall, injury, or accident, and reaction is slow to set in, or is very imperfect—the hot fomentations sedulously applied on the abdomen, as well as any local injury, for several hours, will prove the *greatest cordial* and *restorative*.

Nothing will so augment the failing or exhausted ganglionic power in such cases. If the animal centres give evidence of injury, as from being over excited by the view of danger incurred, or as participating in the general shock and nervous failure, the fomentations in such case also operate a powerful revulsion from the agitated brain, yet *send back to it* all the soothing influence of the moist heat upon the cutaneous nerves. This measure does not prohibit the cautious internal administration of the needful cordials, of which wine, &c., in gruel, often administered, *but in small doses*, is perhaps the best. *Small doses*, I mean for teetotallers. *Tipplers, &c.*, require often large doses to bring them through the effects of accidents, that to the temperate whose *nervous centres* are strong and healthy, would be comparatively innocuous.

8. In all persons exhausted by inveterate chronic ailments, whose organs of corporeal repair are thoroughly prostrate (that is, the blood-making, blood-purifying, and blood-circulating functions, are all radically defective)—in the *debilitated*, the *anæmic*, the *cachectic*, the *consumptive*, the *catarrhal*, and in certain forms of *asthma*—in all such cases, hot fomentations and kindred processes are of the highest value, and of indispensable use. They greatly advance the treatment and progress of the case. They effect this end by the *reduction of irritation*, and by preparing the skin for reaction under the processes generally, and thereby enabling the patient to proceed safely and advantageously to the more tonic and bracing stage of a course of treatment.

9. After feverish symptoms have been reduced by packing, &c., *when a return to bed* is necessary, fomentations will often induce perspiration.

10. Local fomentations to gouty and rheumatic joints, to seats of neuralgia, in certain painful eruptions, erysipelas, &c., may often be applied as an opiate, with the certainty of their *relieving pain, reducing irritation*, and therefore arresting or mitigating the *progress* of *morbid action*. Their temperature, of course, must be regulated by the feeling and state of the patient, and their duration by the relief they afford.

11. In chronic diseases of the chest, asthma, consumption, &c., a short fomentation at bed-time is often a great relief, and of the greatest utility.

12. When over excitement has been produced, by indiscretions, worry, and vexation, or occasional excesses of treatment—shown

often in nervousness and feverishness—hot fomentations and *repose* should be had recourse to for their sedative and restorative qualities.

13. As a *general rule*, fomentations should be performed when the patient is in the recumbent posture, and can take rest after them, as well as that his mind be unexcited. Their *soothing* effect on the nervous and vascular systems would be diverted and in a great measure neutralized by active exertion either of the limbs or of the brain. Neither should they be applied for at least two and a half hours after a meal. Bed-time, in most cases, is the best time for them, that is, when applied to the abdomen or chest in chronic diseases, and when the patient is not confined to bed. In *diarrhœa*, hot and warm fomentation, combined with repose, &c., according to the stage of the malady, is a sovereign remedy.

14. I find that hot fomentations applied *occasionally* to the abdomen for half an hour, as a *derivative* and a *rubefacient*, before the *tepid shallow-bath, cooled down*, enable some patients with chronic duodenitis, and many dyspeptics, with tendency to flatulence, acidity, liver congestion, &c., to walk *briskly* for an hour, *without sense of fatigue*, who would otherwise have felt languid and indisposed to exert themselves. After the bath, the region on which the steaming flannel has been applied, will assume a *florid redness* for a short period, making the operation of the nature of a mild flying blister, but painless, and leaving no marks behind it.

15. In cases where parts have been severely bruised, with ragged or lacerated wounds, if there is much bleeding, the cold compress should first be applied and changed frequently, until bleeding of any consequence has ceased. Then, as soon as possible, the fomenting flannels should be applied, diligently changing them every eight or ten minutes. This must be continued until all *sense of injury*, or feeling of discomfort has disappeared. A piece of fine linen should first be placed on the injured part, and not removed, the flannel being each time placed over it. When this soothing application has done its work, apply wet linen or lint, with the water partly expressed, and a piece of oiled silk, or fine Mackintosh, extending an inch over the wet edges. Should pain and throbbing return, repeat fomentations. By these simple means the cure of wounds and injuries appear all but "miraculous."

Although I have compared the *water dressing* to a *poultice*, as being a household word, familiar to all readers, still the effects are

very different. A poultice has not the healing qualities of water dressing. A poultice is made of materials, which soon become sour, and thereby, after a short time, it becomes an irritating application. A poultice favours the formation of pus, but water dressing either prevents or diminishes its secretion. Instead of the throbbing pain produced by a poultice, all pain is reduced by this remedy, and its tendency is to cure wounds by an approximating and modelling process, without heat, pain, or discharge.

P.—I suppose, from what you have already told me, that Priessnitz knew nothing of the fomenting process you seem to prize so highly?

Dr.—It is to be regretted that he did not. At the time I was at Graefenberg, I have reason to know that the remedy would not have been received by him. In the treatment of many delicate patients, especially where the nervous centres were much implicated, where the nervous system had suffered much, or was in *below-par* condition, he was often quite at fault. He had no idea that the influence of the brain had anything to do with bodily labour (*internal* or *external*), nor did he understand that all bodily labour or muscular exertion, *under the control of the will*, draws its energy and supply of power from the brain. He had never been directed to the study of their sympathies or reciprocal influences. He knew he had volition or will, but the source of the continued supplies of that power, and how injury and morbid conditions were produced by its too long continued or excessive expenditure—he knew not.

P.—I suppose the same remark would apply to the practitioners of any school, whose education had been neglected, or who were indifferent to all physiological studies and reflection?

Dr.—Certainly, and it is well known that, unfortunately, they are a numerous class.

I believe I was the first who ever mentioned the word *repose* in connexion with the water-cure treatment; Priessnitz, from not appreciating all that this word indicates, was deplorably deficient in his management of all the cases where nervous complications existed. He had really no *soothing treatment*, properly so called; drive on and work away was the idea that mainly possessed him; *rest* of *brain* or *body* was not understood by him as an *element of cure*. His theories were necessarily crude, and many of them quite erroneous; still it is a matter for reflection and wonder how much he did, and what *pregnant truths* he hit upon without the aid of any elementary knowledge.

It is a painful, if not an invidious office, to criticise one to whom we owe so much; but, in truth, many of his uneducated followers, both in this country as well as in Germany, not only commit great blunders, but often cling with greater tenacity to his errors, than they have profited by his more perfect and judicious application of the processes.

It has been truly said that Priessnitz created the Water-Cure—for, although water had been used as a remedy for ages, and justly vaunted for its *wonderful efficacy* in many cases, still there existed really nothing worth calling a system for its application before his time. In contriving the different processes he has shown considerable genius, and it is surprising how comparatively little, in that way, he has left for his followers to do.

He had many great advantages that we have not. The majority of the patients remained as long under his care as he pleased; they were far from home, and out of the way of domestic, and other anxieties or vexations; but, in a great many cases, from excesses of treatment, *utter indifference to diet*, and his not knowing the meaning of the word *repose*, much valuable time was thrown away.

He died at *fifty-two*, from want of *repose* and *dieting*—in short, from *brain* and *stomach intemperance*.

P.—Bless me! Pray explain yourself, I had always heard that he was the simplest liver, and the most temperate of men. I was much surprised when I saw in the papers that he had died of "dropsy of the chest."

Dr.—So was I. Still I thought it possible there might have been a complication of that sort, the result of the severe injuries he had received in his youth. It was "a weak *invention* of the enemy." The truth is, he died of a *third* attack of apoplexy. From the *two first* he recovered quickly, by aid of the shallow-bath, with friction, by which means he had himself recovered so many cases apparently hopeless. But he would not take rest or warning, and so lost his life. During the *third* attack of apoplexy, either in consequence of being from home, or from some reason I have not been able to ascertain, the bath was *not used*.

For *twenty-five* or *thirty* years he had been incessantly occupied in a very exciting and fatiguing way. During that long period I believe he had *not had a holiday*. If, like some of our wise London doctors, with but a third as much to do as himself, he had taken a month or two every year for *repose*, for change of air and scene, in all human probability he would have lived on. He

was a strong robust man, but I was not altogether without a presentiment of his fate. During a year that I lived with him, I had remarked certain *signs* and *symptoms*, which are passed unheeded, except by the physiological and dyspeptic observer. I am perhaps at this moment the only person, who knows or had *observed the working of the causes* that led to his premature decease. For many years, about 1,400 patients, of all nations, visited him annually, and the most learned, as well as the highest in rank, of his own country. At one time I heard that it was debated whether he should take the late Emperor in hand, but he at once decided in the negative, considering his case beyond the reach even of the water-cure.

Now came the next grand error—to the want of repose of *brain* came the want of repose of *stomach*. He thought that by excluding intoxicating drinks, and a weak cup of tea or coffee from his table, and his own diet, that he had done everything. The pint or *more* of rich new milk, with as much fresh butter and heavy rye bread, as could be eaten *night* and *morning*—with a heavy German dinner between—were recommended to *all* the patients, and with *regularity* taken by Priessnitz himself.

P.—I now know, that was too *heavy*—too *nitrogenized* a diet for a man with such worrying and incessant brain occupation,—or for *any* chronic disease.

Dr.—I dare say he consumed nearer sixty than sixteen ounces daily of highly nutritious matters; the latter (sixteen ounces) being *nearer* the proper quantity for a man in *moderate* exercise. There were no fast days to counteract this grave error and abuse, no modification of the gormandizing—however wearied the brain, *no repose*—however crammed or fatigued the stomach, *no curtailing the supplies.* The result, with many of the patients, was the loss of half their time, often of their cure—with himself, the loss of his life.

Although Priessnitz had a great fund of common sense, German phlegm, and natural philosophy, still so long a continuance of *uninterrupted excitement*, was a severe trial for the brain of an unlettered man, of rustic habits and education. At last it was evident that his goaded brain, vexed by the goaded stomach—which paid back the *irritation* in kind—could not endure for ever. These years of *offence* against *the organic laws* were tardily punished by a *stroke of apoplexy.* He was regardless of his danger, and blinded to his impending fate by mammon—by that

love of wealth which increases with its possession and rapid growth. He had supped full of adulation, and could not tear himself away from the crowds arriving from all parts of the earth to seek his aid; men of all nations who bowed before him with the faith accorded to the prophets of old,—they hailed him as "*the modern Hippocrates.*" He was still given up with an ardent devotion to his own creation, the WATER-CURE,—and dreading any diminution of his great and well-earned reputation, he would not give in; he could not be induced to seek repose, or rest from his labours.—"All men think all men mortal but themselves!"

I have often thought, if in the midst of this gratified ambition and unwonted success, he could have been warned of the certainty of his impending fate, that his spirit, recalling the dreary and emphatic words of the preacher, would have cried aloud in mournful accents, "Vanity of vanities, all is vanity"—"Gwagedd o wagedd gwagedd yw'r cwbl."—Regardless of the instincts of nature, whose servant he professed to be, and of the warnings he had received, he still worked the enfeebled and weary brain; he was again reminded of his breach of law by a *second* stroke. He recovered again, and resumed his former course; but now the offences against the ORGANIC LAWS had increased until they reached a point beyond which there is no forgiveness. In this bankrupt condition, with wasted resources, nature listens to no appeal, grants no reprieve,—the *penalty* is *dissolution;* the elements now take possession, assume an uncontested sway, and share amongst them all that is mortal.

He was a strong man, intended, by the gifts bestowed upon him by Providence, to live in health for more than a hundred years; he died a premature death at fifty-two.

P.—Ah, I have heard you relate many similar cases of remarkable men. Here we see how first-rate organic machinery may be broken up and ruined by straining and over use. Your word *repose* ought to be written in letters of gold—surely it is not too much to say, that in this transient, fitful scene, this dream of life, the willing labourer is worthy of his *rest* as well as his *hire?*

DR.—What you say is very true, and, putting necessity or propriety aside, it is often a wise economy of time. The prudent husbandman will sometimes put his field in fallow. As a farmer, no man knew this better than Priessnitz, but he applied not the principle to himself. In the midst of all his fame, adulation, and overflowing wealth, I have seen him look *tired* and *care worn;*

and when congratulated on his important discoveries and immense success, I have heard him say, with a mournful instinct, "*Ah, it is all very well, but farming is the natural condition of man.*" He had, no doubt, an inward feeling, which told him that the farmer's occupation, like the patient's water-cure life, was the most compatible with the laws of health, organic happiness, and the chances of longevity—no doubt he had a vivid perception, that the bright emerald blades of quickly growing grass,—the harvest of pearly turnips, plenteously filling the rows with their ripening rotundity,—the undulating expanse of luxuriant corn, changing from green to gold,—and the ample fields of beet-root, with its rich and ruddy hues—send more healthful and cheering rays to the material and mental eye, than emanate, with sombre and depressing influence, from the sallow and pallid skins of sickness and suffering. He felt, as all must, that *digestion* and *circulation* could not go on *so smoothly* when listening all day to the plaints of illness, and subject to the anxieties and incessant solicitude of its care,—as when you are walking in the fields, inhaling the untainted breath of heaven, listening to "the rising of the lark," or humming the old airs—"*Codiad yr Ehedydd*," or "*Megan a gollodd ei Gardas.*"

P.—I have been instructed and highly interested by the brief and painful history you have just given me. To change the subject, now tell me, in the name of goodness, what *dead* language is it, that I so often hear you quote from,—that I find so impossible to pronounce, and difficult to spell?

Dr.—Indeed, truth, it is not *dead*, but the *most prized* and *original* of four other *living languages* that I find pleasure to converse in, when opportunity offers—the oldest, and in my ears, the most musical. It is a language that was spoken in this island before Rome had a hut on her seven hills. It possesses also the richest qualities, for social converse or divine teaching,—either for the turbulent utterance of angry passion, or the harshness of resentful invective,—for the soft and subduing appeals, prompted by the most tender and cherished affections, or the stirring eloquence inspired by a love of freedom, and the defence of a nation's liberties. Such is the Iaith Gymraeg—or Ancient Briton.

I shall now be glad, having done with the melancholy recital you solicited, to return to the more *soothing* one of fomentations, and the *best mode* of applying them, so as not to mar the operation, or cause any discomfort to the patient.

It is as follows:—to prepare for the process, *two blankets* should

be folded so as to be about two feet wide, less or more, and stretched across the bed, so placed that when the patient lies down they should be under the hips, and reach a few inches higher than under the pit of the stomach. This is for the double purpose of keeping the bed clothes dry, in case of the flannels dripping at the edges, from not being sufficiently wrung, and for wrapping round the patient after each hot flannel is applied. The many folds of the blankets retain the heat, and absorb the ascending vapour. The night-dress must be *carefully tucked up* to the arm pits. Four folds of *thick* flannel, something more than half a yard, large enough to cover the abdomen, from the pit of the stomach to the pubis, and from loin to loin, are well wrung out of hot water, and dexterously placed, as indicated, either by the patient or the attendant. The ends of the blanket bandage are then quickly brought over the steaming flannel and tucked in on each opposite side, repeating the same with the under blanket. The bed clothes are then comfortably arranged about the patient, and he is left in quiet. Every five or ten minutes, as the flannel cools, or as soon as the genial feeling of warmth is less perceptible or gone, it is replaced by another. Two flannels, of course, are requisite, to create no delay in the changing; some patients require, and like to have the two flannels applied at the same time, in that case, there should be four at hand. The best plan we had for obtaining the flannel *hot and sufficiently* dry, before I contrived a machine, was by placing it in a basin, and pouring sufficient boiling water to soak it well, then taking it up with a towel, which was rolled round and wrung, — a plan which saved the hands very considerably.

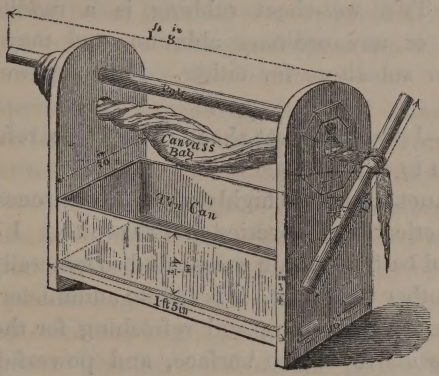
P.—I have no doubt that this simple and salutary process, the utility of which must strike every one, has failed in its *popularity* and *frequent use* from mismanagement. The first time I had it applied in town, late at night, some years ago, I found when it was over, that the flannels had dripped at the edges, that the bed under the hips was quite soaked, my night-shirt, not well out of the way, was also wetted. In fact, though much relieved, and made sleepy by the operation, I was much vexed, and got chilled by having to get up and change the wetted linen. I was put out of conceit with the whole thing. I had only a towel applied over the *half wrung* flannel, the effectual protection of *two blanket bandages* was left for the care and ingenuity of the *practical* water-doctor to suggest.

Dr.—Many good things in this world, in remedial as well as other matters, are lost or thrown away, by not being used properly. I will now briefly describe this simple fomenting machine, and how I came to contrive it. Riding a fiery horse up to fifteen stones with hounds, we went at racing speed at a rail and fence, but unfortunately he made a mistake, brought the rail down, and went over on his head into a deep ditch. The pummel of the saddle rested for a time on my breast, crushed the ribs, and in getting up the horse broke some of my small bones. When I had recovered from the stunning, a cold pespiration broke out and continued. I was assisted home, and as soon as possible, got myself placed under the operation of the lamp-bath. During the sweating, flannels wrung out of hot water were handed under the blankets, which I applied as well as I could to the chest and ribs; this soon converted the *cold* into a *warm* perspiration, which was continued for half an hour. I was then assisted into a bath at 100°, where I reclined for ten minutes, and then had it cooled to 80° for two minutes. When in bed I had hot steaming flannels well wrung applied to the chest, ribs, ankle bone, &c. Great pain now commenced, and I could only with great difficulty draw sufficient breath. The fomenting flannels were renewed frequently for seven hours, before I was quite free from acute pain. The change every eight or ten minutes was neatly and pleasantly managed, without discomposing me in the least, but the hands of my servant and his assistant were sore, from the frequent wringing. I tell you these simple particulars, that you may know the best thing to be done, in the event of your ever experiencing such an accident. A very clever surgeon, who was in the house under my care at the time, expressed his surprise at seeing me on the sofa consulting with my patients two days after the fall. This I undoubtedly owe to the *fomentations, hot baths cooled down, compresses,* and the *genial revulsion of gentle sweatings.* The injuries were very severe, for I felt their effects for many months.

P.—As—the civic *aid* of your *magic lamp* when from home—"*Boots*" would say, the water remedies "*broke the neck*" of the accident, that nearly *broke yours*,—that is, as you would say, by dissipating all *sense of injury* as soon as possible, and with it the stagnations and other morbid phenomena that follow in such cases, and interfere so much with the rapidity with which Nature, *undisturbed*, sets to work with her reparative processes.

Dr.—Whilst still in bed, and reflecting on the value of fomen-

tation, and the obstacles to its use, already mentioned, I drew a complicated and expensive machine for wringing flannels, and marvelled I had not done so before. This, in a few more sketches, I simplified to its present state, which answers perfectly. It may be obtained at Mr. Lamb's Library, Malvern, or made by any carpenter, for a few shillings.



Fomenting machine for wringing a flannel out of hot water.

The wooden bar, an inch and a half in diameter, serves to carry the machine, and is a little thicker inside the holes, to resist the inward pressure, when the piece of canvas is tightly twisted. It is held firmly by the left hand when the handle is turned round. The piece of canvas is simply tied with twine to the protruding end of the bar, and the same to the handle. The piece of canvas should be thirty inches by fourteen inches, to hold the flannel, and to leave some to spare for the fastenings, and the shortening when twisted. The tin can, to receive the dripping, is moveable, and made to fit. There is no iron-work, and it can be taken to pieces in a few minutes. The half yard of flannel is dipped in a can of boiling water at the side, and laid on the canvas, and twisted as dry as possible.

THE WET-SHEET RUBBING.

CONVERSATION CVIII.

DOCTOR.—THE wet-sheet rubbing is a modification of the shallow-bath, or any ordinary ablution, and may be used as a preparation or substitute for either. It is a powerful tonic and stimulant.

PATIENT.—I find the wet-sheet rubbing so refreshing, that I have got quite to enjoy it.

DR.—I cannot speak too highly of it. This process is one of the admirable practicable discoveries of Priessnitz. I do not know a more beneficial bath in certain cases; and so generally applicable as an adjunct to other treatment. It is safe to administer, salutary in its results, and very exhilarating and refreshing for the moment. It is a strong revulsive to the surface, and powerfully rouses the organic and animal energies—summarily removing languor both of mind and body. It answers for almost every case, and under almost any circumstances. It does not permanently chill; there is but one *chill*, and it is instantly warmed by the body. It does not, therefore, abstract a great amount of animal heat; yet it may be made at will to give a shock or stimulus of considerable power so as to act most beneficially on the languid system, as it can bear it. By the active friction it permits, it *ensures* reaction, and tends permanently to *fix* an increased circulation on the surface.

P.—In what cases do you most recommend the wet-sheet friction?

DR.—In the beginning of the treatment of chronic diseases, say for the first week or two, or three, when the patient is much debilitated. It is an excellent substitute and preparative for the shallow-bath. It is then a safe test of the condition of the skin, and of the reactive powers of the patient generally.

It is used as follows:—the sheet is steeped in cold water, and wrung just sufficiently to prevent its dripping. In this state it is thrown over the patient, who, embracing the fore part with his hands and arms, commences rubbing the face, chest, and fore part of the person, at the same time that the attendant pursues the same process on the back, loins, and lower extremities. This may

be continued for two or three minutes, when it is replaced by a dry-sheet, and the rubbing repeated until the patient is well dried. The impression of cold seems only to be skin deep before it is followed by a pleasing and general warmth, approaching a glow. In very cold bloodless subjects, it may be advisable to continue the dry rubbing in a blanket for two or three minutes.

With nervous patients, the sheet may be placed gently over the shoulders, the head being left out, so as to avoid all shock. This is requisite in some cases of asthma, congestions of the chest, or head, or determinations of blood to either.

It may be applied with advantage in many cases before, and after a short sitz-bath, with a dry rubbing-sheet. Many delicate or enfeebled subjects will find a TOWEL-RUBBING sufficient to begin; that is, towels half wrung out of cold, chilled, or tepid water, the patient using one and the bath attendant the other, briskly.

I may here describe the WASH-DOWN—a sort of intermediate process. The patient stands in an empty bath with a bucket of water by the side, and two large coarse towels. The bath servant from behind lays a dripping towel on the patient's head, which the latter seizes and draws down all over the front of his person, rubbing well with it the face, neck, chest, &c. The attendant uses the other dripping towel with similar effect on all the back parts of the body. This operation may be repeated two or three times with the strong. Once will be sufficient for the feeble. Some patients when the first rubbing is over like to produce a succession of small shocks, by pouring water over the head, shoulders, and different parts of the person, with a quart or pint jug.

THE FOOT-BATH.

CONVERSATION CIX.

PATIENT.—I SUPPOSE the foot-bath is of great use in your water-cure practice. According to your *rationale* (which appears to my humble judgment very rational indeed), it must powerfully deter-

mine *revulsion*, drawing the current of the fluids from the upper to the lower parts of the body.

Doctor.—Without a knowledge of this *revulsive action*, all attempts at explanation of the water processes would be vain.

The most valuable boon, in the shape of a remedy, that man could receive, would be that that would enable him perfectly to *control the circulation*—to equalize the distribution of the blood—to slacken its currents when too rapid, to accelerate them when too sluggish. And this done without injury to the digestive apparatus, or nervous centres. This the agency of the water-cure accomplishes better than any other curative means yet revealed to us.

P.—From what I have seen of its working, I think it might be affirmed to be, without presumption, omnipotent to cure most, if not all, diseases, if resorted to *in the beginning*, ere yet disorganization of the solids and fluids has taken place.

Dr.—You have *reasonable* grounds for much that you believe. In many acute diseases, in malignant fevers, in *neglected* cholera, plague, and other endemic and epidemic diseases, this destruction of solids and fluids sometimes occurs with awful suddenness, so as to make of no avail the best directed curative efforts of man.

The *extremities* properly managed, are powerful means of *derivation* from the central and upper parts of the body. They can be very conveniently subjected to the processes of cooling and friction, by which the circulation, and calorifacient actions can be powerfully promoted. The new or augmented physiological actions set up, take place at the expense and relief of engorged tissues, excessive circulation, or painful nervous action elsewhere. By this revulsive action they relieve pain, fidgets, lassitude. They afford very decided and prompt relief in most cases of nervous headache, even toothache, &c. They are sure, by repetition, *permanently* to *warm cold feet.*

P.—But why may not foot-baths be used of *warm* or comfortably *hot* water, as well as *cold*, since you say that the cold water-cure is a misnomer—being only *cold* water-cure when patients can tolerate and enjoy the tonic and refreshing effects of *cold* water?

Dr.—Why not? With scientific practitioners of the water-cure, they are frequently used, and are found a very available resource in cases demanding sudden relief, as in colics, diarrhœa, vomitings, sore throat, incipient congestions of the head, &c., occurring during states of exhaustion, after great exertion or ex-

posure to cold. Then a foot-bath or leg-bath, to near the knees, of 100°—110°, from ten to fifteen minutes, with or without mustard in it, will often operate like a charm, with a stimulant cordial administered internally. These measures will *not* dispense with hot fomentations to the bowels or throat, which should be afterwards more or less prolonged, according to the relief afforded.

P.—But I suppose cold or chilled foot-baths avail you most in the treatment of chronic disease?

Dr.—Yes; by their nature they are most fitted for such cases. They tend to operate the disgorgement of loaded or obstructed circulation everywhere, by the afflux of fluids they determine, or call away, from the seats and centres of morbid action. Notably they relieve congestion of the digestive viscera, and of the animal and organic nervous centres. Thus with a man's brain and stomach both often relieved promptly by one remedy, can he feel otherwise than hilarious and comfortable?

P.—But is not the powerful impression on the nevous system an important element in the beneficial effects foot-baths produce? How quickly that lady the other day came out of her hysterics, by having her feet well rubbed in cold water.

Dr.—As I have impressed upon you before, it is beyond all dispute, that the nervous or dynamic impression on the vasculo-nervous web of the skin, and its reflexion thence on the nervous centres, go for a great deal in the soothing, refreshing, and exhilarating effect produced by bathing processes of every kind. The contact of cold water with the cutaneous surface, may be said to propagate a series of electric flashes of sympathetic nervous excitement over the whole body. In this the nervous centres, especially the visceral ganglia, receive the largest share, and in turn they as powerfully *react* on the viscera, rousing especially their sluggish circulation and tardy or arrested secretions. *In the soles of the feet and the palms of the hands, the plexus of vessels and nerves is highly elaborate in consequence of their functions as tactile organs,* the most useful and most used instruments of the mind and will of man. It is because of the exquisite fineness and sensibility of their nerves, that pain in these organs is so painful. Hence they are pre-eminently fitted to be sources of salutary impressions to the rest of the economy when agreeably stimulated.

P.—According to your account, then, foot-baths are powerful auxiliaries of the sitz-bath and other processes, in chronic diseases of various kinds?

Dr.—They are. But to be of *permanent* benefit, they require

to be systematically and perseveringly used. If resorted to merely now and then, of course they can only be palliative. But so would be packing, or sweating, or the sitz, or the douche, or any other occasional and merely temporary measure.

P.—What rules or limits do you intend to give me with reference to the use of the foot-bath?

Dr.—The foot-bath, like the sitz, and others, being essentially derivative in its action, whether its effect is to be *stimulant* or *sedative* will depend upon the degree to which it is pushed.

I. For the merely stimulant operation, or for the simply refreshing purposes of the foot-bath, its duration should not exceed ten minutes, its depth four or five inches, and its temperature 55° to 65°. Active friction all the time, whether of one foot against the other, or by the hands of the bath-attendant, is indispensable—never by the patient, if he be debilitated, nervous, or irritable.

II. For purposes of *sedation* (as for cerebral excitement, headache, toothache, and face-ache, congestive pains of the chest, &c.), the water may be six or eight inches deep, and its temperature 70° to begin with, gradually lowered to 60°, and its duration from twenty to thirty minutes. The friction also must be unintermitting and well laid on—and never by the patient himself. The bath may be repeated after a few hours, if the symptoms recommence.

III. The wants of a case, the pathological condition of the patient, must be the guides of the sort of foot-bath to be given. Too large a quantity of water, too cold water, too prolonged a bath, or insufficient friction—in short, the abstraction of heat carried beyond the safe point of reaction, would militate against the end proposed by the bath, would permanently chill.

IV. When it can be done, active exercise should be taken, before and after the foot-bath. In this way it is the best remedy for *curing* habitually *cold feet*.

V. Never place the feet, if cold, in a foot-bath I have been describing; better, if there is no other way, to warm them thoroughly first by four or five minutes immersion in water of 100°—110°, and then cooled to 55°. The subsequent warmth and reaction will be more perfect.

The same remarks as I have made in regard to *foot-baths* apply to *hand-baths*, and elbow-baths, &c. The benefit of the hand-bath, and its refreshing effects, consist in the stimulation of the nervous extremities being propagated to the nervous centres by the same nervous sympathies and connexions, and by the same derivative actions being set up. The elbow-bath is used exclu-

sively as a revulsive in cases of wounds, critical boils, &c., that are painful, to arrest inflammation, and to keep the hand cool. The elbow is either placed in a basin of water, or cold compresses are kept applied and constantly renewed; the water dressing being simultaneously used to the affected hand. By this means the activity of the circulation is concentrated in the neighbourhood of the elbow, the afflux therefore to the hand moderated, and inflammation thus kept down.

P.—What remarks have you to make on the subject of HEAD-baths?

DR.—Used in the proper case, at the proper time, and of the proper temperature and duration, it is a bath that produces great relief to suffering. The essential of the bath is, that the back of the head be kept in cold water,—the duration, from five to fifteen minutes, and at an average temperature of 60°—70°. But observe well of this bath, it is not recommended where there is any *active* mischief, acute or chronic, within the head, where any determination of blood or tendency to apoplexy exists, but purely and simply in cases of nervous pains of the head, neuralgia of the face and teeth, cephalagia, tic, migraine, or intractable rheumatic pains of the scalp, nervous exhaustion from fatigue, or excitement of the brain, in deafness, diseases of the eye, chronic coryza (*vulgo*, snuffles).

P.—Why do you not recommend this bath when there is active inflammation in, or determination to, the brain?

DR.—Because the abstraction of heat from the immediate neighbourhood of the disease would only tend to increase the rush of blood in that direction, and thus augment the evil. This is the foundation of the grand therapeutic canon, not to operate revulsion but at some distance from the diseased tissue or locality. It is, therefore, bad practice; it is contrary to the genius of the water-cure, and to the dictates of the true knowledge of derivation, to operate exclusively upon the head itself in cases of *active* disease, or where there are inflammatory symptoms, within the head. In such case, *the rest of the body*, and action on a *larger surface*, must be evoked. But in all, what might be called dynamic diseases of the head, it is a valuable remedy.

This bath is taken in the horizontal position, and on the floor; I prefer it given on a sofa or bed, without a pillow: a basin with a little water in it is placed under the head. The water, as it gets warm, can be absorbed by a sponge, and replaced, if necessary.

THE DOUCHE-BATH.

CONVERSATION CX.

PATIENT.—I SEE by some of your old prints that the use of the douche-bath is of very ancient date.

DOCTOR.—It is so; but you must have remarked that it was only used as a *local* remedy. Before the time of Priessnitz, there was only a rude mode of letting water fall on such parts as joints, or where there was stiffness from local injuries. For a long time this was the only way in which it was used at Graefenberg; then it occurred to Priessnitz to apply it to the whole body, as a powerful revulsive and stimulating bath.

P.—He was the first who used a cold douche-bath as a constitutional remedy, for daily use, or to be frequently repeated?

DR.—Yes, it was reserved for the great original water-doctor, to hand this powerful remedial operation down to us. It is a highly intensified degree of the action and effects of the shallow-bath, the plunge, or the wet-sheet rubbing.

P.—The douche, I suppose, belongs exclusively to the treatment of chronic diseases?

DR.—It does; and it is then properly admissible only, in most cases, in the advanced stages of the treatment, or in decided convalescence, when all the more pressing indications of *visceral irritation*, or local inflammation, have been removed. It is, therefore, unfit, as long as constitutional excitement is unremedied, when any active local disease exists, whenever there is fever or inflammation. Before prescribing the douche, the judicious application of *fomentations*, *packings*, *sweatings*, *compresses*, *local baths*, and *proper dieting*, must have done their work, in reducing all intense irritation or inflammatory action in the primary viscera.

P.—And you would add, *due exercise* and *repose*. How is an uneducated or non-professional man to know all this?

DR.—He does *not* know, and is therefore liable, and often does much harm to persons who are unreflecting enough to trust their persons to his care.

P.—I am puzzled to know, with such incompetence, how they manage to keep up appearances, and get on with their patients?

Dr.—Simply because the patients are a *shade* more uninformed, and more ignorant than themselves on such matters. Knowing little or nothing of disease, or diagnosis, and very little of the water-cure, they must prescribe in the dark and at random. Priessnitz was a *rare* man, backed by immense experience and keen perceptions, but, although from years of close observation he had formed to himself a crude system for detecting morbid action, or changes affecting the different organs, he nevertheless could not avoid committing many deplorable mistakes from want of this indispensable knowledge of pathology and diagnosis.

P.—I hope our conversations will aid a good many, by *inducing a desire* to pursue a course of studies in the right direction.

Dr.—I trust so, that is an intention I have always kept in view.

P.—What are the physiological effects of the douche?

Dr.—The douche is a powerful stimulant of the whole system—one of the most powerful we can administer. Organic life seems intensely roused in the first instance, and the animal life seems to participate in the exhilaration. The heart beats full and steadily, but *more slowly*,* and the circulation on the surface of the body is immensely quickened and stimulated. In this way, it is powerfully revulsive from the interior to the exterior, from the centre to the surface—thereby operating to unload congestions and to liberate obstructed secretions. The douche seems a highly *perturbative* process,—stirring up, as it were, from its foundations the whole system, and casting forth by the natural channels or outlets the *lees* or *dregs* of disease, morbid humours or *impurities*, that may have long tainted the fountains of life, and poisoned all its currents. Hence, in proportion as the douche is well-borne and persevered in, as its powerful determination to the surface by transfer from the interior, is daily repeated for weeks in succession, and adequately sustained by the organic powers, a great constitutional effort comes at length to be put forth, and perhaps long pent-up materials make their way to the surface, or force an exit by some of the natural discharges. This constitutes the water-cure *crisis*, so gladly hailed both by patient and practitioner—whether it be as the *sign*, or as the *agent*, of relief.

P.—Would you be so good as to examine for me the particular elements of the action of the douche?

* In ninety cases out of a hundred, notwithstanding this exhilaration and powerful stimulation, the pulse is *tranquillized*. A remedy to please a physiologist.

Dr.—These may be divided into its *primary* and *secondary* effects. In the *first* class I rank the immense abstraction of heat, the rush of fluids to the surface, and the activity of the chemico-vital actions to replace it. *Secondly*, the vivid stimulation of the nervous extremities, and the reaction thence on the nervous and circulating centres. Lastly, the excitement of the superficial capillaries, the friction of the skin, and the kneading of the subjacent muscles, induced by the powerful impingement of a heavy column of water descending from a height—the strokes of which may be likened to the blows of so many small hammers.

In the second class of the results of the douche are to be included the perturbatory actions referred to, the unloading of visceral congestions, the removal from the remote recesses of structural, from the byeways into the highways of the body, of a *materies morbi*, and the restoration once more of a free course to arrested or pent up secretions; in all this is implied the removal of every impediment to the free play of the grand vital viscera.

P.—I presume that the greater the strength of the patient, the colder the water, the harder the friction (that is, the thicker the column of water, and the higher its fall), and the longer the duration of the whole process, the greater will be the reaction, and the more decided its benefits? I have often come from under the douche as red as a boiled lobster, and in a state of extraordinary exhilaration and muscular vigour. The pulse only 64.

Dr.—This is all very true. But do not run away with the praises of the douche. It is not a measure to be hastily recommended or indiscriminately applied. I do not know a process that requires more caution in its prescription. It is powerful, I admit, for good; but it is equally powerful for evil. It has, therefore, been much abused, and this often through no fault of the doctor. However formidable the douche may seem to the uninitiated, nevertheless it soon becomes familiar and divested of its terrors; and its high relish and appreciation by those once accustomed to it make it a favourite, so that patients are often with difficulty restrained within the just limits of their prescriptions. And not only are they apt to over-do the douche, but every other part of the treatment. Conscious of daily growing benefit, and clearly referring their amendment to the hygienic measures pursued, they are very apt to think they can never have enough of them. Besides, what makes the douche most liable to abuse is, that being considered by many the crowning measure of treatment, and

usually the prelude to a curative crisis—the breaker up of morbid elements within the body and the hastener of their elimination—it is often eagerly anticipated, and prematurely snatched at as something that will *certainly* realize the patient's long cherished hopes of an emancipation from ailments that had previously poisoned the cup of life.

P.—What are the specific morbid effects of the douche?

Dr.—The morbid effects of the douche are best appreciated wherever there is diseased brain or heart. These organs, when not diseased centres in themselves, nevertheless receive the reverberations, as it were, of diseased actions everywhere else. Thus sympathising, the tonic excitement and perturbations of a process like the douche, are too much for organs already enfeebled or excited by their own derangements.

P.—What are the directions you would mention for the due administration of the douche?

Dr.—The following, I think, you would do well to bear in mind:—

1. The douche should be taken only by prescription, and never on the responsibility of the patient. Before taking the douche the heat of the body should always be a little elevated by exercise. A brisk walk of twenty minutes, therefore, should usually precede it: however, if the respiration and circulation be much accelerated by the walk, it is advisable that the patient rest a few minutes previously. Noon is the best time for the douche.

2. The douche must always be taken *after*, never *during*, the labour of digestion.

3. Begin gradually. A douche of weak power should first be used, and according as the patient takes to it, or the system bears it, proceed to the douche of the highest power, which should not exceed a fall of twenty feet, and a column of water of three or four inches diameter. The duration of the douche may be, for the minimum, half a minute; for the maximum, two to eight minutes.

4. The douche must not be allowed to fall directly on the head, or on the region of the heart and stomach. The two last should be altogether avoided. The douche when falling on an erect person is always slanting, so that what some people call a "slanting douche," which projects the water at the person, has really the effect of what they imagine a perpendicular fall produces. This projecting douche has every objection; it has the same effect as if the patient was in the recumbent posture under the fall of the

ordinary douche. A pain may be *fixed* in a part by this ill-judged proceeding.

5. During the douche the patient should exercise himself by moving the body in all directions, as if he were on board ship in a swell. It is a good plan first to let the water splash over the head, breaking the force of its fall by the hands crossed and held above the head; this breaks the ice, refreshes and removes any feeling of chill; it is then allowed to fall on the back, shoulders, sides, hips, thighs, and legs, giving *preference* to the *best covered* and more fleshy parts. The *soles* of the feet are also for a few seconds presented to it, once or twice.

6. When douching, move from side to side, across the spine, *not up and down.* An over-*chilled spine* produces very disagreeable effects. The nape of the neck should also be avoided, except by a quickly passing brush occasionally.

7. Care must be taken to dry the body thoroughly after the bath, by active rubbing with the sheet, to refresh and replace compresses, and dress quickly, and to walk, or otherwise exercise briskly—*walking is the best.* Thus the glowing reaction is maintained.

8. In order to avoid any *chances* of chill after the douche, it is prudent to avoid drinking much water, only sip enough to refresh, except when the health is all but perfect, and the stomach so natural and sound as to be able *rapidly to absorb* larger draughts of water.

9. In some cases of paralysis, or any chronic lesion of the nervous centres, the douche should be prescribed with great discrimination; *care* must be taken, even if the malady is of ancient date, the morbid focus relieved, the appetite good, and the general health encouraging.

10. In winter, if the weather is severe, none but the convalescent and robust patients should take the douche.

11. In "used-up" patients,—cases characterised by shattered nerves, feeble circulation, languid secretions, &c.—where a long depraved digestion, or great dietetic improprieties, have radically impaired the constitution of the solids and fluids—the douche must be tried with great caution. Precursory, general, and local measures must first be used, to *get up* the prostrate organic energies. Nevertheless, occasionally, such patients—especially those of scrofulous constitution—and many *very delicate looking* ladies, are found to bear a *gentle* douche, in fine *warm* weather, better than anything else, and to improve rapidly under it.

12. The douche must be used with great caution, and only after some preparatory measures, in what is termed "sluggish," or obstructed states of the digestive viscera, in "torpid bowels," "*congested liver*," &c. The brain, in such cases, is generally as abnormal in its action and sympathies as the organs primarily affected, and will not bear the stimulation of the douche. Here again, the *reduction of irritation* must *precede*, by the use of fomentations, packings, gentle sweatings, chilled ablutions, sitz and foot-baths, compresses, and wet-sheet rubbings, &c.

13. Where the ganglionic system has been much abused, where inveterate dyspepsia prevails, accompanied with gloom, depression, and that cohort of miserable mental feelings constituting hypochondriasis, the douche must be tried with the same cautious reserve as is indicated for the last two kindred categories of cases. The preparatory or *soothing* treatment is more judicious, and within the scope of the tolerance of the patient, and much more *genial to his feelings*, as well as more *curative* in effect.

14. In cases of rheumatic joints and limbs, when the faults of the digestive functions and blood-making, which lie at the foundation of those diseases, have been remedied, and general measures counteractive of the constitutional effects of the disease have been successfully administered, then *local* douches, with a brief application to the whole body, may be tried, but with caution. All active irritation, all chronic or acute inflammation, must first have been subdued. *Then*, no other means will so speedily rectify the lingering faulty action of the muscles, sinews, nerves, and secretions of the joints.

THE PLUNGE-BATH.

CONVERSATION CXI.

PATIENT.—I FIND you do not use your plunge-baths as much as I expected.

DOCTOR.—Only in the case of the robust patients, or those far advanced in the cure. The shock that may be thus received is

perhaps as great as any we could possibly give; provided there be sufficient constitutional stamina, or if the system be powerfully roused by passive perspiration, it is followed by strong reaction. But I do not like shocks of any kind, if not agreeable; even in the plunge-baths, I would rather the majority went in quietly.

P.—Had I not, in the course of your practice, felt in myself, and seen in others, the innocuousness of cold ablutions, or a plunge-bath, after *free and long continued passive* perspiration, I should have *theoretically* supposed it attended with great danger.

Dr.—So many people think; but that is only one of the "vulgar errors." The theory on which such danger is grounded is based on prejudice, disingenuousness or *ignorance*,—not on physiology, good faith, or the *desire* for truth and knowledge. The danger is a fiction.

P.—Of course the practice is not to be indiscriminately adopted by patients, or at their own option or suggestion?

Dr.—Of course not. *No part of the water-treatment* should ever be advised without a minute reference to all the circumstances of each individual case; and these may vary frequently, with the thousand modifying elements of human existence.

P.—What rules do you propose for the safe and effective administration of the full cold-bath or plunge?

Dr.—As this bath, like the douche, is a highly bracing measure, it is generally used cold.

1. It is, therefore, only advisable for the more vigorous patients. It may be taken simply on getting out of bed or warm from the blankets in the morning; after the wet-sheet packing; or after the sweating process; or at noon, after a *refreshing* walk.

2. The patient should walk to the edge of the bath with his blanket envelopes about him, so as to avoid the risk of chilling the skin before immersion. Before plunging, dip the hands in cold water, and with it lave the forehead, face, neck, and chest, or let a wet-sheet rubbing of half a minute precede it. The duration of the bath will vary according to circumstances—the minimum time is that necessary to get in and out; the maximum time three to five minutes. Active friction of the whole person with the hands, and active movement in every way possible, must be practised all the time of being in the bath. The head should be once or twice dipped under water, or washed freely with the hands.

3. Under no circumstances must the patient remain in the bath

till any sensation of numbness or chill is felt. There is no danger so long as vapour arises from the arm held out of the water,—for this shows that there is a sufficiently elevated temperature of the body. On issuing from the bath, the patient to be instantly enveloped in a large dry sheet, and very *active*, but not *rough*, friction used in drying. The patient should dress quickly, and then walk briskly for half an hour at least. The morning, or three hours and a half after breakfast, is the best time for this bath. If a patient is unable to use exercise after this bath, he is unfit to have it at all.

4. The cold plunge is to be forbidden to persons having a predisposition to cerebral or thoracic congestions, or with any organic disease of the heart, lungs, or brain. It is also to be renounced, if any marked stupor, oppression, giddiness, sense of fatigue, or *malaise*, takes place on coming out of or after the bath. In all such cases, the safer measures are, the chilled or warm shallow-bath *cooled down*, with sufficient friction for a few minutes at each interval, with or without the wet-sheet packing, or the sweating process.

P.—I now begin to understand clearly, why *so many* are disappointed with the results of seaside and indiscriminate bathing, where there is no reference to *time* or *temperature*, *dieting*, or *bodily condition*.

THE SWIMMING-BATH.

CONVERSATION CXII.

PATIENT.—I AM surprised you have not a swimming-bath, and so make your bathing department complete. It is a bath I should now enjoy immensely.

DOCTOR.—I have often thought of having one, for my more robust and convalescent patients. I should frequently like a good swim, as well as yourself. I have given a plan, to be executed forthwith and without delay, for two swimming-baths, about sixty feet long, to be placed *side by side*, the one to be cold, and the other tepid. So that you can go, or vault from one into the other. In the dressing-rooms there will be every convenience for all pre-

paratory processes that *may be prescribed*, as advisable and valuable adjuncts, in certain cases, as packings, vapour and lamp-baths, warm, tepid, and cold shallow-baths, &c. Each bather must have at least a warm or tepid wet-sheet rubbing, or shallow-bath, before going into the swimming-baths,—which of course will be abundantly supplied with warm and cold water, the latter obtained from the *spring*, and remarkable for being the *softest* and most pure in England. The suitable dress for gentlemen, of a linen waistcoat and swimming trousers, will be found ready made in the hands of the bath servants, to be purchased for a trifle, either by visitors who have permission to bathe, or the friends of my patients. As a matter of course, a certain time will be given up to the lady patients, and their friends.

WATER,

AND WATER DRINKING, UNDER WATER-CURE TREATMENT.

CONVERSATION CXIII.

Heil! Heil! auf's neue!
Wie ich mich blühend freue
Vom Schönen, Wahren durchdrungen———
Alles iſt aus dem Waſſer entſprungen!!
Alles wird durch das Waſſer erhalten!
Ocean gönn uns dein ewiges Walten.
Wenn du nicht Wolken ſendeteſt,
Nicht reiche Bäche ſpendeteſt,
Hin und her nicht Flüſſe wendeteſt
Die Ströme nicht vollendeteſt,
Was wären Gebirgen, was Ebnen und Welt?
Du biſt's der das friſcheſte Leben erhält—
Du biſt's dem das friſcheſte Leben entquellt!—

GOETHE'S FAUST, Second Part.

PATIENT.—I REMEMBER reading, in your first book, your laudation of water, which, with most of your readers, I at that time thought rather superlative. I should like now to hear what you have to say, after so many years of practical experience.

DOCTOR.—I have nothing to unsay—but could add, with unvarnished truth, much that would be thought still more exaggerated.

The great importance of water to the animal economy you may infer from the large proportion it bears to the entire composition of the solids and fluids, being *seven-eighths* of the whole.

P.—From this—the necessity of its free use in health, and the advantages of its scientific administration in disease—is apparent enough to me as a non-professional man.

DR.—And this, because the moisture of the body is not like the water of a stagnant pool, but like that of a running lake—ever renewing, ever filling, ever emptying; the large waste of the body, its incessant exhalations, secretions, and excretions, creating a constant and copious drain. Independent of the purely *chemical* operations promoted by water in organised structures, its simply *mechanical* agency is all-important. Viewing the various parts of those structures as so many pieces of a nice machinery, unless the relative proportions of water in them were kept up, derangement or disease would occur alone from the want of that smoothness, softness, and expansibility of parts, which its presence confers, and which are conditions indispensable to the due performance of their functions.

P.—You have referred to the *chemical* agency of water in living bodies. What is that more particularly?

DR.—Water presents the essential conditions and materials—*conjointly with the air received by the lungs*—for those decompositions and recombinations by which all the component parts of the frame are incessantly renewed.

P.—I wish you would now tell me, what are the more particular *mechanical* functions of water in the animal economy.

DR.—In the first place, it modifies the composition of the fluids in general, and of the blood in particular. Secondly, is a diluent and solvent of the solider alimentary matters and their waste constituents in the intestinal canal. Lastly, it is a vehicle for carrying the nutrient principles therein prepared into all parts of the organism. It serves also as a menstruum in which to dissolve and *carry out* of the frame its *wasted, deleterious,* or *diseased* particles. In this last item of its *mechanical* utility, water is to be regarded as the grand purifier of the innumerable canals and reservoirs, pipes, sewers, and passages of man's complex machinery. This is no low or unworthy idea. It is an idea that has been advanced by some of the *first* names in science, as explaining the undoubted

cleansing efficacy of the water-cure in frames corrupted by the combined impurities of disease, diet, and drugs. Every drop of water *absorbed* by the stomach-coats, I have reason to believe, does not *necessarily* course the entire round of the circulation, for there are the passages of pitti, which lead directly to the kidneys. But it is highly probable, that they are brought into requisition chiefly when there is an *excess* of fluids to be disposed of. Under ordinary circumstances, and in the generality of cases, there is every reason to believe that the water is absorbed at once into the general circulating system, and chiefly by the veins, and that it goes the entire round of the body, *dissolving* and *abstracting* more or less the crudities it meets with in its course, and finally passing off charged with their impurities, by the various excretory outlets of the body. The copious dilution of the fluids is literally and truly a washing out of the solids.

What, I would ask you, can exceed the *beauty, freshness,* and *purity* of a glass of water taken from the spring? It leaves behind it no mawkish taste, no factitious or unpleasant odour. When it is taken during a walk before breakfast, after a bath, general ablution, or some hydropathic process, what can be more *refreshing?* it cleanses all the passages, purifying the mouth, filling it with sweet and pleasant fluids, and making the individual *cheerful, hungry,* and wide awake.

P.—It just strikes me as curious, that in dilating, as I have often heard you, on the properties, uses, and abuses of the contents of your medicine chest, its many specifics, new and old, its lacerating chemicals, deadly decoctions, and poisonous extracts, I have never once heard you use the word "*refreshing.*"

Dr.—You remember well all I have told you of the *abuses,* forgetting my explanation of their *uses.* To return—this drinking cold water moderately in the morning, I beg you will particularly remark, also ensures, in due season, the *regular relief,* so salutary and much desired after breakfast. How many there are now in this country who will cheerfully respond to the observation I have just made,—invalids, who having adopted this simple plan, can now relate, that the pill-box and purgative draught, so long thought indispensable, have for years been laid aside, no longer needed—discarded as "domestic plagues, disagreeable, and injurious."

I am also free to confess, that I never enjoyed such perfect, uninterrupted health, as during nearly two years, that I took no fluid —with the exception of an occasional half glass of milk—except

water. During that period (although I had for a long time previously dreaded eating, finding everything disagree), I ate *all* that came in my way, in moderation. *I did not know that I had a stomach.* This is much for one who had been an old dyspeptic to be able to say, and that too, after having gone through so many years of fast living, combined with the incessant occupation, *night* and *day*, of a large private practice in London.

When I found the water-cure, I found a blessing. Now, when mounting the hills, with the refreshing coolness of a glass of water still on the palate, in time for the first rays of the sun just gilding their summit, how often I find myself with buoyant heart and thankful spirit, repeating the appropriate and beautiful lines of Tasso:—

> "O liquidi cristalli, onde s'estingua
> L'ardente sete a miseri mortali!
> Ma piu salubre e, se tra vive pietre
> Rombendo l'argentate e fredde cora
> Incontra il nuovo sol, che il puro argento
> Co' raggi indora."

Notwithstanding that theory and practice have demonstrated in every possible way that "*water is best*," the majority of mankind have yet no idea of the extent of its salubrious effects, when taken as a *remedy* in proper quantities *internally*, or applied in different ways *externally*. The long indulgence in *bad habits*, produces an unhealthy state of feeling, a deadening and perversion of the *body-conscience*, attended with the fear that cold water must necessarily produce unpleasant sensations, and some permanent injury to the stomach. There is, therefore, with the multitude, backed and fostered by much *erroneous* medical opinion, a barrier to its use, made up of influence, dislike, prejudice, and custom. When I returned to this country, half a dozen tumblers of water, less or more, prescribed to be taken before breakfast for a particular purpose, was thought a very dangerous and dreadful proceeding.

P.—I have heard you and your system held up to ridicule, with reprehensive insinuation, that you countenanced or advised twenty or thirty tumblers of cold water to be swallowed before breakfast, as a matter of course, finding it so *very* refreshing.

Dr.—Humbug and nonsense. In the published account it was stated to be only an "*experiment*," made by a zealous water man, in "*perfect health*," who also adds in a foot note, "that patients

should not make such attempts, but rather be on the right side of doing too little, than too much."

P.—Well it really is a comfort, and I *am* happy to know that you do not insist on thirty tumblers, as the ordinary morning modicum. Moreover, I have also heard that, this "water drinking produces dropsy—dilutes and impoverishes the blood—and that disease of the kidneys follows as a matter of course." Late even as last summer, when there was not a vacant room in your house, many of your patients told me, that they were *confidently informed* before they came here that the water-cure was "quite done up," that although there might be *something* in water for *certain cases*, "it certainly would not do for *their* case," warning them at the same time that, "*most probably* the *first* bath would prove *fatal*."

Dr.—Set it all down for what it is worth,—that is, the emanation of interested malignity and innate malevolence. But many know better, and it is therefore of the worst forms of dishonesty and untruth—hypocrisy, with cultivated cunning, wearing the mask of candour, and so adroitly assumed on every fitting occasion, as to lure the unsuspecting to receive the *shadow* for the *substance* of honesty.

P.—From your large intercourse with mankind, no doubt you are aware of the fact, that there are people occasionally to be met with, whom one never has heard, by any good fortune, uttering a word of approbation of any living being, or acknowledging even the possibility of good, in one mortal thing, *not their own*. They seem to labour under the egotistical delusion, that to confess even to themselves the perception of any merit in others, would be tantamount to accepting a tacit reproof of their own unworthiness, and moral deficiencies.

You will *excuse me*, but I think it only *friendly* to tell you, that I have often heard your Sanatorium sneered at; I have often heard it said that no *gentleman* would keep a water-cure establishment,—that it was unprofessional,—in short, that you water doctors were little better than hotel or lodging-house keepers.

Dr.—It is just possible, that all this time, we have been flattering ourselves, with having done a meritorious act in building water-cure establishments for the reunion and benefit of invalids (independently of personal motives), and for perpetuating the practice of the water-cure. Be this as it may, I can only commiserate the low breeding and innate vulgarity of soul, that could utter a sentiment so mean and ungenerous, or conceive an idea so

borné and unphilosophical. A man may be a gentleman and do something more than let houses and lodgings,—he may clean his horse, and his shoes, or *his neighbour's*,—or break stones on the highway, if it came to that, and still be a hundredfold a better gentleman, in the best sense of the word, than many an one who is "clothed in purple and fine linen and fares sumptuously every day." Now, no more of your *friendly* reminiscences, if you please, but let us resume our subject.

P.—So!—Well, you have given me a very *tangible* and *practical idea* of what the water-drinking part of the water-cure is and does. It is a very straightforward, common-sense, and feasible means of *clarifying* the fluids and solids of the body, of *cooling* and *moistening heated* and *morbid localities*, of remedying their faulty constitution, of giving vent to surcharged humours by opening the natural outlets and safety-valves—sweeping out, in short, long accumulated rubbish, that had encumbered and caused stagnations in the highways as well as the byeways of the system, impeding the living traffic. I suppose you fitly compare the canals, conduits, and reservoirs of the animal structure, to the streets, lanes, and courts of a teeming city. You make it out that these corporeal *thoroughfares* from the lungs, intestinal tube, and the capacious sanguineous main-pipes, down to the smallest veins, arteries, and capillaries, or hair-like vessels, go daily through a process of *rinsing*—are literally *scoured out*, as you would a dirty sponge or sewer—by the copious use of water, without and within. All this comes very home to us. We understand this. In this way, at least, you give nature clear and clean ground to work upon, with one of her own unsophisticated elements; and you afford her besides the pure air, the wholesome nourishment, the corporeal exercise, and the mental quiet necessary,—and leave her then unimpeded to rebuild the dilapidated structures of diseased man.

Dr.—And she does build them up when *seconded*, and every *fitting material* and *condition for successful labour* is afforded her. By the whole hydropathic appliances secretion and excretion are stimulated to great activity, and are enabled to liberate, and to eliminate morbid elements, waste materials, crudities, and impurities of all sorts, lodging in the organism. Great is the power of the nervous system, I admit; but without purified passages, and without cleansed and healthy blood, in vain will it be stimulated or soothed, flogged or coaxed to do its work.

P.—I see, it would necessarily fall back into the doldrums and

a maladive condition. Well, what have you to tell me of the *vital* agency of water in the animal economy?

Dr.—In consequence of temperature, and most probably of some more secret and indescribable influence (electric?) on the nervous system, water powerfully modifies the vital actions and endowments of the frame. It especially controls the circulating system, and the organic and animal nervous apparatus, and acts alike in both on their centres and on their extremities. Hence its immense power and universal applicability as a remedial agent. No medicinal substance—no dietetic article even—can be put in comparison with it, in regulating, abnormal, deranged, defective, or excessive action in those mysterious confines of life and organisation—the secret laboratory of chemico-vital processes. It reduces their action when above par, and exalts it when below par. Water, skilfully administered, of course I am speaking here of its effects when taken internally, can thus become a *stimulant* or a *sedative*, of all others the most innocuous. This soothing or stimulant effect of water does not end with *relieving the oppressed functions* of the interior parts it more directly comes in contact with,—that is, the mucous membranes, their vascular and nervous tissues,—but its action, one way or the other, is transmitted to the nervous centres, the intestinal ganglia, the brain and spinal chord —*their* morbid sensibility is diminished, *their* vital endowments intensified. These vital centres being tranquillized or stimulated just as they require it, they are in a condition to exercise their healthy control over the muscular, circulating, secretory, and absorbent systems. The *stomach*, the *bowels*, the *heart*, and the *lungs*, the *head* and the *mind*, the *sensations* and the *movements*, —even the *thoughts* and *affections*, all participate in the genial influence. This is called *reaction*, when induced by water applied to the cutaneous surface. It is the same phenomenon in the interior, when cold water is duly ingurgitated in its time of need. Not only are the necessary elements for chemico-vital operations affected, when water is swallowed by the thirsty, feverish, or choleric patient, but by the abstraction of internal heat the operations in question are augmented in order to supply its place. In this way, the functions of nutrition, of deposit and of waste, are quickened. Bit by bit, aided by diet and regimen, &c., morbid processes are checked, abnormal tissues broken up, and the impediments to healthy function are removed. In an especial manner the remedy addresses itself to nervous derangements and vascular

obstructions, that obstruct the path of nature,—that constitute, in fact, the *material conditions of disease.*

P.—And so, in this way, the *vis medicatrix*, liberated from all drags and entanglements, resumes her sway and works her wonders.

Dr.—It is just so. The *vis medicatrix* is another expression to signify that the body was so originally constituted by the Creator, as that its organs should functionate in one direction, *health*, so long as every normal law and condition of the structure is fulfilled; but every abnormal agency acting on the body is a suspension, *pro tempore*, of its original constitution. Disease or derangement of healthy action then takes place. When the abnormal agency is removed, then the original conditions and constitution of things come into play, and *health is the result.* So that the phrase, *vis medicatrix naturæ* to the reflecting and philosophical mind, does not imply an *entity*, but simply expresses *the tendency of the organic actions to proceed in the straight path appointed them at the first by the Creator, when the* CAUSES OF DEVIATION *are removed.*

P.—That too, is clear. Well, from your exposition of the nature, uses, and operation of WATER as an essential constituent of animal structures, it will not for a moment be disputed that its methodical introduction into the system, over and above the mere ends of thirst, may answer the most valuable curative purposes.

Dr.—With your *theoretical* conclusion, the *practical* experience of medical men of every age fully coincides. From the views laid down, which I have no doubt the physiologist will find conformable to truth and nature, and from my own observation for the last dozen years, in a great multitude of cases, as well as on my own person, of the internal operation of water as a therapeutic agent, I have deduced the following, as hints for your guidance:—

General rules for water drinking under the water-cure treatment.

1. The *purest water*—that of springs and that most charged with oxygen, or carbonic acid gas—is the fittest for the general drinking purposes of the cure.

2. It is desirable that the water should be drunk fresh from the springs, during the walk, if possible.

3. Never drink great quantities of water in a short space of

time, except when prescribed to relieve the stomach of its contents, or to promote a salutary diarrhœa. With the beginner, the water should be drunk slowly, and gradually increased in dose, according to the *absorbent ability* of the stomach. For only that amount of water is beneficial, which is absorbed without much discomfort. From ten to fifteen or twenty minutes should intervene, between each glass of water, or half a tumbler, drunk slowly, may be taken at shorter intervals. This rule is especially necessary to be attended to by patients not accustomed to much water drinking, and with stomachs very sensitive or much deranged, in short, by all those in whom absorption is slow. As the treatment advances, and the patient's capabilities increase, such intervals as the above may be allowed between each couple of glasses, until the prescribed quantity is taken. A glass with us is a half-pint measure.

4. A great aim of the water-cure being to operate a revulsion from the interior organs, to determine blood to the surface and extremities of the body, and to allay any irritation in these organs, all *chills*, from too much, or too cold, water-drinking, are especially to be avoided, as tending to defeat such aim. Bodily activity is therefore to be promoted by every means.

5. Walking is very necessary during water-drinking, as the exercise that best quickens the circulation, developes heat, excites the secretions, and exalts the exhalant functions of the skin and lungs. To facilitate the increased organic decompositions comprised in these processes, and to repair the corporeal waste they effect, water as well as food are necessary. But under the condition now insisted on, the water drunk, however freely, within certain limits, does *not* remain in the blood. What is not used for vital and chemical purposes, *passes off with great rapidity*, charged with the *impurities* of the blood. Water, therefore, *duly* taken, however freely, *cannot dilute the blood.* On the contrary, it *cleanses it*, as well as its channels, and hence one clear and great advantage of the water-treatment, even in cases where it fails to effect a cure.

6. The greatest quantity of water is to be drunk when the stomach is *empty*, in the morning before breakfast. Then the coats of the stomach are fittest for the absorption of water; and the brain, refreshed with rest and quiet, is in the best condition to receive and communicate its salutary stimulus: besides, the fluids of the body then most need replenishing, drained as they have

been by the long fast, and the unwearied organic operations tending to exhaust them. The average morning dose of water for a patient under full treatment, is from *four* to *six* tumblers, at least. The length of the walks, the amount of treatment, and the strength of the patient, &c., determine the precise quantity.

7. The next most suitable period for water-drinking, is towards the end of the digestion, and after the digestion, of a meal. Half the morning's dose will then, as an average, be sufficient: this taken before dinner and supper. Drink only a very small modicum before bed-time.

8. Water-drinking may be indulged more freely in summer than in winter, because the excretories are then more active—with water of moderate temperature than with *very* cold, because much of the latter may produce *spasm* in the unpractised drinker, or in the weakly.

9. A sure rule is to drink short of oppressing the stomach.

10. Never drink profusely if heated, and more especially if tired with exercise. In *passive* perspiration, free drinking, if gradual, is innocuous.

11. Young children and old men must be more restricted in water drinking than adults; because of the feebler organism and lower reactive powers of the former.

12. Patients of strong constitution, of sanguine or bilious temperament, and whose digestive organs are not much at fault, may drink more largely, as in them it is absorbed more rapidly.

13. Patients of lymphatic temperament, and persons accustomed to alcoholic liquors, stimulant spices, strong tea, coffee, &c., must use great discretion in water drinking, as they absorb it more slowly, and pass it off less quickly.

14. In cases of *nervous* dyspepsia, when there is much morbid sensibility of the stomach, and great irritation of its nervous ganglions, small quantities of water must be begun with, quarters and half tumblers at a time. It is sometimes necessary in these cases, also, to raise its temperature, because of the susceptibility of the irritable brain and stomach of such patients to receive and reproduce morbid impressions.

15. In cases of *mucous* dyspepsia, frequent *sips* of cold water, and lounging quietly in the air, during the fever of digestion, refreshes the stomach and sustains its flagging energies. In all other cases of dyspepsia, no fluid should be taken for *at least* two hours after a meal.

16. In persons of *strong* stomachs, moderate cold-water drinking with meals, materially aids digestion—by diluting the ingesta, cooling the stomach, provoking its muscular contractions, and stimulating its glandular secretions. It is then rapidly absorbed.

17. In patients with good appetites, but whose maladies would be aggravated by its indulgence, it is advisable to drink more copiously during meals, to ensure the satisfaction at least of a distended stomach! For *that* feeling, in any innocent way produced, some of such patients will be duly thankful; at the same time it often makes digestion more easily gone through, and with less feverish depression.

18. When there is much febrile irritation in the system—in cases of severe critical eruptions and discharges, in the hectic of bronchitis, consumption, lumbar abscess, and other scrofulous ulcerations—water drinking may be recommended, and allowed *ad libitum*.

19. In simple cases of nervousness, where the *fons malorum* is more in irregular determinations of blood than in decided vitiation of the fluids—(although the effect of *all* congestions, by locking up secretions, or impeding chemical changes, is *pro tanto* to vitiate the fluids)—the drinking of *large quantities* of water is injurious. In such cases, the blood is thin at the best, and an excess of water introduced, by too greatly diluting the circulating mass in the brain, even for the *short time that it lasts*, materially aggravates the nervous symptoms—producing palpitations, and often, a sort of tipsy feeling.

20. In *anæmia* and *chlorosis*—diseases characterized by an impoverished state of the blood—in patients who have been bled largely, or have suffered accidentally great loss of blood, or who *periodically* are subject to profuse drains—until the blood-making functions are nearly restored, and the peculiarity in question counteracted, great care must be taken not to drench their systems with copious and repeated doses of water.

21. In fevers and inflammations—in cholera, dysentery, and diarrhœa—especially when the skin is dry—the patient's thirst and relish for water should be the measure of its quantity.

22. When there is much congestion of the intestinal mucous lining (as in chronic *gastro-duodenite*, enterite, &c.), the too free and sudden introduction of water, by producing too strong reaction in the parts affected, may only aggravate the morbid condition it was meant to allay. Here the brain as well receives the unkindly

shock, *and resents it*—sending down through the viscera increased morbid reverberations; calling forth, among other effects, those irregular contractions of the stomach, that determine in various degrees, *spasm*, false sensations of hunger, unnatural cravings, gnawings, sinking, faintness. These are frequent results of self-treatment. In such cases, increase the water doses very gradually, and also their temperature to between 50°—55°.

23. In cases of simple congestion of the brain—from the same exciting effect of water on the circulation and nervous centres—much water-drinking is injurious, until the *digestive organs* are *repaired*, the advance towards cure has produced a more equable distribution of the blood over the *surface* and in the *extremities*.

24. In cases where the obstructed circulation of the brain is so great as to oppress its functions, and produce sluggishness of movement and sensation, lethargy or stupor, or an approach to these states—water-drinking (from its stimulant effect) in a moderate degree, under judicious management, is indicated.

25. The season of the year, the age, sex, constitution, condition, and habits of the patient, the nature of the case, and the state of rest or motion, are the modifying circumstances that regulate the inward administration of water. Under the heads of the various *kinds and classes of disease*,—about which I hope to converse with you on a future occasion,—I shall endeavour to fill up the want of *personal* professional direction, to lay down *specific* directions, as well as data for judgment. In the mean time, suffice it to remark, that *habit* influences much the ability to drink water. *But large doses, even when they agree*, as they generally do with myself, *should never be long continued.* They bootlessly fatigue the stomach, gratuitously absorb much animal heat, and needlessly excite the nervous system.

26. Water enough to refresh, should be drunk after each bath, in most cases. A properly administered bath does not cause the blood to flow inwardly, the effect and the fact are quite opposite. It clearly derives *from the interior* to the surface, unloading its accumulations, and even drawing away, for a time, its normal supplies, in order to throw the blood powerfully to the surface. This increased circulation *there* is necessary to replace the rapidly-abstracted heat—so rapidly abstracted, often, that a red-hot metal statue subjected to the same process would be cooled to its very centre in the same time. Yet has the living surface retained its standard temperature to within a few degrees. Whence, then, has

all this immense evolution of caloric come from, if not from the surges of blood brought (from every spareable quarter in the interior) to the surface—like so many hot-water pipes keeping up the temperature. This heat, so largely abstracted, is evolved from the waste of the tissues, *the burning up of structure.* The decompositions, quickened to that end, powerfully draw upon the supply of oxygen, and therefore of water. *This* is the *real* reason for the necessity, or rather the great *advantage*, of cold-water drinking and exercise after the baths. Herein lies the true *rationale* of the great remedial doings of the water-cure in diseases hitherto intractable: herein is *one great source* of its superiority over other systems.

27. Lastly. For the interior, as the exterior, operation of water to be highly beneficial, it is an indispensable condition that the *brain be at rest* from worry and anxious cares, from literary labour, and from the operation of intoxicating drinks of any kind, from opium or tobacco in any shape. For the stimulus of water, *directly* received from the stomach, or transmitted *indirectly* by the route of the circulation, or from the shock on the outer sentient surface of the body, most of all *tells* on the nervous system. To exalt the functions of this part of man's wondrous structure is one great aim of the water treatment throughout: because the nervous system, the *primum mobile* of all organic power is, as it were, the electrical battery wherein it is elaborated, and whence is propagated that mysterious influence that imparts life, sensation, and movement to every fibre, tissue, nerve, and vessel of the economy. Hence the supreme importance of exalting the functions as we now do,—in a *normal*, or *healthful and rational manner*,—of this prime regulator of corporeal health, and dispenser of mental well-being. For the Creator has inseparably allied, in this world, the condition of the *morale* with the *physique.* In order, therefore, to give the brain and nervous system unimpeded scope for exalting the restorative powers of the animal economy, all disagreeable impressions on them must, *for a time*, be as far removed as possible. On the other hand, it is also well to be observed, that the agreeable sensations indulged in, be of a kind that entail no exhaustion and admit no regrets. *Verbum sapientibus.*

CASES.

AUTHENTICATED EVIDENCE OF THE EFFICACY AND SAFETY OF THE WATER-CURE.

PATIENT.—I HAVE listened to all you have said about the water-cure processes with very great interest, and I have no doubt that the day will come when every medical practitioner will be *obliged* to be as familiar with their use as you are yourself. Now, having said so much, I should particularly like to see what the individuals most concerned, I mean the patients who have lived in your water-cure hospital, and who have *felt* the effects of your processes, have to say in their commendation.

DOCTOR.—At one time I thought I had quite made up my mind not to publish any cases in this volume.

P.—I am glad you listened to my advice. I am persuaded you would, as an advocate of the water-cure, have made a great omission in the present phase of its progress, and at the same time have done some injustice to yourself. Many of us read cases who read nothing else, especially if duly authenticated—viewed in any way "*facts are stubborn things*"—leave it therefore to us to sift and explain these facts, according to our several dispositions, or powers of appreciation and analysis. Show me then your *trophies*, and those of the water-cure. For this you have precedent enough in every department of society, and in your own profession also, from the highest to the lowest, each according to his means, or as seems to him most fitting. I am sure it will be a more grateful and worthy tribute to your *amour propre* than *a full length portraiture* in any Medical Journal, however flattering.

DR.—Very well. But before doing so, let me remind you that we have often *incurable cases* at the water-cure, as you might naturally expect, who come with lingering hope to a new and vaunted system. I would desire no better evidence to convince any intelligent medical practitioner of the excellence of our method, than to show him the amendment that is effected in such cases. There are others who *will not* or *cannot* stay to be cured, when perfect cure is within easy reach. Many there are who, after experiencing remarkable benefit, and expressing much satisfaction, return to habits incompatible with the long continuance of health,—they put up with quiet suffering, *live on morbidly*, and seem to retain but a

faint remembrance of the health and buoyant spirits of which they are capable, and once enjoyed. Others again, notwithstanding the daily wear and tear, and the anxious care of extensive commercial affairs, continue their sane course, founded on the lessons they learnt at the water-cure, and so happily enjoy the health it enabled them to regain.

I will now, with little further preface, lay before you sufficient evidence to enable you to form clear and faithful ideas of the *kind of maladies* we have to contend with, and sufficiently remarkable at the same time to convince you, and I hope your friends, that they are not all *malades imaginaires*, as many say and suppose, who come to Malvern. Although the profession, as a body, have lent a deaf ear for the last ten years to the evidence and arguments laid before them during that time, in the many able works which have appeared on the water-cure, from the pens of experienced and scientific practitioners, I am of opinion that this *deafness* will continue for another ten years with but *little amelioration*. I shall therefore now lay my evidence of the efficacy and safety of the water-cure before you, not as a pure *clinique médicale*, but in a popular form; what I have by me in the former way, I shall reserve for a riper period, or a more fitting occasion, that may soon present itself.

I could easily have collected a large volume of letters like the following ones, and as remarkable, in exemplifying the value of the curative system I advocate and practise; but, in truth, on each occasion that I decided on making use of such documents, the idea did not occur to me till the eleventh hour, or the moment they were required. What you see were given to me by patients I happened at the time to be engaged with.

To begin, read the following letter, and tell me what you think of it. I will then give you some explanations and details. It is of recent date, as you perceive. I have omitted all the doctors' names without Mr. Coleman's permission; he will tell you if you wish to know.

CASE OF BLOODLESSNESS, LIVER CONGESTION, ETC.

"*London, Clarendon Villa, Notting Hill,*
"*Feb. 1st,* 1854.

"My dear Sir,

"It affords me the greatest happiness and satisfaction, to be enabled to add one more testimony to the efficacy of the water-cure. My wife is now convalescent; she says that she feels quite well, and is *stouter* than she ever remembers to have been.

"I can have no doubt that this happy result has been obtained by hydropathic treatment.

"My wife's case is a very marked one, and although well known to you from personal explanations, I think it necessary to record it thus formally, that you may make what use you think fit of the *facts*.

"About ten months prior to my writing to you from London, she had an attack of jaundice, whilst staying at Dover, and was then very kindly

and skilfully treated by my friend Dr. ——, who brought her through the disease, but in a very prostrate state.

"Upon my return with her to London, I placed her under the medical care of Mr. ——, our neighbour, and called in to consultation the eminent Dr. ——, *who thought her case hopeless.*

"About two months subsequently, at the earnest request of another medical friend, I consulted Dr. ——, who stands, I was told, most eminent in the profession, for the correctness of his diagnosis. Dr. —— made a very careful examination, and pronounced the disease to be anæmia, which he familiarly explained to me was absence of blood, a want of the power to make blood, in fact, that 'the blood-making functions were dead,' &c. He said the disease was not a common one, though he had had in a lengthened experience many cases, which had all—with one exception—proved fatal, *and therefore he could give me no hope.*

"I then made up my mind, despite the discouragement of my friends, and the natural repugnance of my wife, in her poor emaciated state, to bring her to Malvern.

"I have great reason to be thankful that I was impelled to this step by the very decided opinions of the most eminent of the faculty of the hopelessness of her case.

"To you, my dear Sir, I can only repeat my grateful thanks for your great attention to my wife in her long and trying sickness, and with our united good wishes,

"I am, my dear Sir,

"Yours very truly,

"To Dr. Wilson." "Benjamin Coleman."

P.—From this account it appears indeed to have been a very serious business.

Dr.—This case, you perceive, before presenting itself at the water-cure, was fairly given up by *two* of the most eminent physicians in London; men, I may say, possessing all the medical knowledge of the day,—excepting ours,—worthy professors of the healing art, of ample experience, and deserved celebrity. Moreover, two clever and experienced water-doctors also said of this case, that "*the patient would not, or could not, recover.*" Assuredly there was here every appearance of a dead-lock—the cold grasp of the grave apparent—or, as I heard some one say, "death staring us in the face."

P.—How did you manage to undo the knot, and solve the difficulty—how was the cure accomplished?

Dr.—I remember the time, before I was a water-doctor, when I should not have known what to do, but from my subsequent experience, I was convinced there was but *one* way left in this *particular case*, and that was, by *making the chronic state acute.*

P.—I do not understand you; I never heard of such a proceeding.

Dr.—Very probably not. You know that every medicinal means had been already tried—*a year had elapsed*, and the *downward course* was steadily *progressive*. This lady came to the water-doctor alive, and that was all—a pallid, bloodless subject, yellow and emaciated; as Dr. —— said to her husband, "the blood-making powers dead"—added to this, *dropsy* was setting in rapidly.

P.—I see how it was; there seemed no way to produce an attempt at a rally, and the doctors were in despair. What did you say or think when you first saw her?

Dr.—My *diagnosis* was as follows—viz., 1. Congestion and enlargement of the liver. 2. Chronic inflammation of the pyloric end of the stomach and duodenum. 3. Hardly blood enough left to sustain life, and that of the poorest quality. 4. The nervous system all but giving up the contest. My *prognosis* was—recovery, and most probably, in due time, a perfect cure.

P.—That I suppose is what your partial friends call your "*clairvoyance*," or gift of "intuition."

Dr.—Why, I had in the years preceding, and since I became a water-doctor, seen a good many similar cases, some recovering and some dying; but, although I never undertook a worse case, or one to all appearance more forlorn than this—I felt that I saw my way pretty clearly—I felt an inward confidence of a happy result, from some peculiar points I detected in the case, and from making comparisons with what I had seen. Not long ago, a near connexion of my own, a gentleman rather older than myself, in a condition embracing many of the essential features of this case, threw away his chance. He came to me and remained nearly a week. Notwithstanding all my remonstrances, he went home, as he said, on important business, promising to return in less than a week, but he never returned; a few weeks after he left me he died at home. I saw no difficulty in the way of his recovery, for his case was in no way so critical and dangerous as the one under consideration.

The poor lady patient in question was in constant pain, she could not bear to be touched; by way of shaking hands with her, I could only gently take the tip of her finger. There was nothing left to be done by ordinary medication, nothing to be expected from tonics or purgatives, from mercury, iodine, or iron—nor by leeching, cupping, blisters, seatons, caustic issues, &c.; there would, there could have been, but one result from the use or repetition of any of these remedies, viz., more speedy dissolution. I have no doubt she would have died under their operation, they would have hastened more quickly the morbid processes, the more speedily have used up and impoverished the little blood remaining, the sooner have produced exhaustion of the feeble nervous power left. I felt assured from all I could recall of my past experience, that there was

but one remedial system left—the hydropathic; and here even, I was driven into a corner. *Cold water,* applied in any way in her condition, was quite out of the question; she could not have borne it, there would have been no reaction, and she would have sunk under the repetition of a proceeding so ill-advised, reckless, and unphysiological. To raise a storm, to bring matters to a *crisis,* or to make the *chronic state acute,* as I have already mentioned, it was necessary to augment the action of the heart and vessels, rouse all the energies of the ganglionic or nutritive nervous system, and intensify the chemico-vital changes, by a graduated course of *external* stimulation and revulsion. This was done principally by *gentle sweating,* by aid of the lamp-bath, followed by *hot baths cooled down,* with all the friction she could bear. With the increase of organic action, irritability and sensibility were soon intensified. The effects I desired to produce were evidenced in the deeper yellow of the already jaundiced skin, the hot surface, and quickened but steady pulse, greater pains of the limbs, and the general prostration accompanying acute symptoms. Had I not had at my disposal *efficient remedies* for *soothing* and *sedation,* I should have undertaken such a case with great unwillingness. This powerful and steady revulsion from the interior to the exterior, was *repeated* and allowed to continue until the desired effect was produced, and a new action set up, to remove the stagnations in the *morbid localities*—in fact, in the *fons malorum*—which caused the *dead-lock* I have mentioned, and its consequences—*bloodlessness, wasting,* and *debility.* For a long time I had visited my patient at early dawn, at noon, and night, and now came the time when all my resources for the *reduction of irritation* were called into play—to calm the organic tumult, to ease the machinery, and soothe the suffering organs. Castor oil was the only aperient used, and it is generally the best in such cases. I have seen it carry away incredible quantities of bile, in morbid conditions similar to those in the present case, sometimes green as pounded grass. The acute symptoms gradually subsided, and I was glad to hail the first signs of a *convalescent appetite.* By and bye the patient was able to sit up, with a cleared complexion, *the jaundice gone,* and the *expression* of the *countenance* completely changed. Notwithstanding these satisfactory and hopeful results, the *dropsical effusion* gradully increased, until the lower extremities were really enormous; it extended to the hips, and my patient was becoming impatient of their size, which prevented her moving: I promised her that, in due time, after a few weeks for *rest,* and *the regular eating that was now going on,* I would commence my measures for carrying off the dropsy, which would leave her as *light* as she could desire; it was done rather more easily than I expected, and in a short time we had literally nothing left but the *bare bones* of the lower extremities.

Now an APPETITE *set in* that lasted for weeks; it appeared as if she could neither think, talk, nor dream of anything but *eating;* it was not the stomach alone, but the whole body calling for supplies to fill the emptied

vessels. To a medical practitioner it was delightful to hear her—she was eloquent on matters of diet. A *physiologist* might fancy he heard the voice of the organic functions uttering their imperative demands for nutrient solids.

P.—I quite appreciate the situation. How maternal is Nature's tender care for the silent wants of her organic offspring—kind delegate of the Guardian Supreme, how admirable are all thy ways—even in dreams possessing the sensorium with thy promptings, with visions of being seated, with exhaustless appetite, at tables of wide spread and luxurious feasts.

Dr.—You are right. All now was *plain sailing;* and, need I add, when recalling the past, what satisfaction I felt whilst listening to this amiable and interesting lady, singing duets with her daughter in my drawing-room, —and solos too, like another Sontag; and when coming from the piano, to hear her whisper she was getting so *stout*, it was quite distressing. I must not forget to mention that in this case, an ample head of hair had nearly fallen off, and what remained had become perfectly *grey;* now it is growing again, and the grey is rapidly changing to the original *brown*.

P.—I consider this altogether a very interesting case, and upon my word I am beginning to think I should have no objection to be a water-doctor.

Dr.—Be assured you might do worse; but do not imagine, that passing two or three days in a water-cure establishment, and taking the dimensions of the various baths, will make you one.

Letter from the Rev. Edward Wood.

Here is another case of anæmia or bloodlessness, with congestion of the liver and other complications, differing however from the former one in many essential points, and requiring a different mode of treatment. In the present instance a tonic and refreshing system of treatment was necessary from the first, admitting of the use of *cold* water in the various appropriate modes of its application. This patient, although pallid, yellow, and very weak, could also take walking exercise.

CASE OF LIVER CONGESTION AND STOMACH COMPLAINT, WITH ANÆMIA OR BLOODLESSNESS.

" *Skelton Parsonage, Ripon,*
" *Jan. 23rd*, 1854.

" My dear Sir,

" I shall be glad if you will add my testimony to the efficacy and safety of the water-cure, for I have good reason to speak well of it.

" It is nearly three years since I placed myself under your care, to give it a fair trial.

" You will remember what a debilitated and nervous state I was in, partly from frequent and excessive loss of blood, and partly from a very much disordered state of the stomach, of long standing; both complaints having been of a very obstinate character, and but *temporarily* relieved by medicines. In truth my friends had little expectation of my ultimate recovery.

" Before the two months I was with you were expired, I found myself in far better

health than I had known for many years, and, since that time, I am thankful to say *I have not had a day's real illness*, and have never taken medicine in any form.

"I may add, that we have seldom used any other than hydropathic remedies for our children; they were particularly successful in the hooping-cough.

"I hope to show myself to you before long, and spend a few days in your establishment.

"Believe me to be,
"Very sincerely yours,
"EDWARD WOOD."

The patient who wrote the following letter, was also weak, pallid, and bloodless, but with complications differing from the two cases already given. He improved steadily from the first, gaining flesh and healthy colour, with the subsidence of *all* his grave symptoms. The treatment was simple enough, consisting of hot fomentations, compresses, gentle sweatings, followed by warm and tepid-baths, *cooled down*, partial packings, sitz-baths, and moderate water-drinking. Before he went away he could enjoy any kind of bath, but I considered that *another month was necessary* to establish the health thoroughly, and make what I call *a cure*.

P.—So, I perceive that "pleasure *first*, and health *after*," is the motto of nearly all patients, in Malvern as well as London. As soon as we are out of danger, resolutions fade and the past is forgotten.

CASE OF LIVER DISEASE AND CHRONIC DYSENTERY, ETC.

"*Malvern, Oct. 16th*, 1853.

"MY DEAR SIR,

"I LEFT India in August, 1851, on sick certificate, with liver disease and chronic dysentery. During the *two years* I have been at home I have been under the best medical care, and I believe have tried every kind of treatment, but to no purpose. When I entered your establishment, the beginning of August of this year, all my symptoms were as bad as ever; and it was evident matters could not go on much longer with me. In fact, I had given myself up as *incurable*, and had prepared myself for the worst. Suffice it now to say, that after nine weeks' water-cure treatment, I feel quite well, and no doubt, with care, will continue so.

"If you think this brief testimony will influence any forlorn sufferer, such as I was a short time ago, to try the water-cure, I shall be very glad to see it in your new work, some proofs of which I saw on your table.

"To-morrow I must leave you, but be assured I shall never forget your kind attention, and the happy days I have spent with the numerous and friendly patients in your establishment.

"I rémain, my dear Sir,
"Very truly yours,
"WALTER LLOYD,
"Lieut. 11th Reg. M. N. I., Coedmore House, near Cardigan."

DR.—The following letter from T. Beale Browne, Esq., of Salperton, near Cheltenham, appeared *ten years* ago in one of my former works. He was here this summer (1853) for a month, looking well, but requiring some *water-cure repairs*. This is his letter:—

CASE OF KIDNEY DISEASE, ETC.

"54, *Welbeck Street, London,*
"*Dec.* 27*th*, 1843.

"My dear Dr. Wilson,

"I cannot leave Malvern without expressing my gratitude to you for the signal benefit I have received, together with my dear child, from your water-cure treatment. I own I was very averse to the system, but I was induced to read some books on the subject, my judgment was convinced, and I determined to give it a trial. I began, according to the directions, to drink nothing but water, and deriving benefit from it, I made up my mind to consult you, and put my little boy under your charge. By God's blessing upon the means used, I was soon entirely cured of a complaint in the kidneys, which had been deemed incurable by many of the first medical practitioners in town and country. I also suffered severely from several other complaints brought on by the constant use of aperients and other strong remedies; these soon yielded to your admirable system, so that for many months I have taken no medicine, and am perfectly cured.

"My little boy came to Malvern in almost a dying state; indeed a relation has since said he did not expect his life could by possibility last three months. His foot, which had been bad for some time, had become gradually worse and worse notwithstanding the treatment of the best medical practitioners in town and country. In a short time there was a great alteration for the better, and in a few months he began to run about, which he does now without any ill effects; his foot is as nearly well as possible, and his general health is marvellously improved; indeed the same relation has said that these two cases of themselves are sufficient to establish the water-cure. I have to thank you for your kind attention and skill, and believe me,

"Yours very sincerely,
"T. B. Browne."

P.—Ten years appears a tolerably long respite, when I see that his complaint was "considered *incurable* by many of the first practitioners in town and country." I should like to know the precise nature of the ailment, and the peculiarities of the case.

Dr.—I dare say he will tell you if you will inquire; he is a man of honour and a gentleman of fortune, as well as being a very amiable and benevolent person. Suffice it for me to say, that during the last ten years he has been riding all sorts of horses of his own breeding; and often thrown, by breaking in himself the most dangerous and intractable. Pretty active doings for an "*incurable*" man with his malady. His was one of those kidney complaints, in which copious dilution with our pure water is of great use. Some anxious friends made an attempt to dissuade him from following my advice, but he did not heed the interference. So you perceive that pure water instead of causing kidney complaints is the best remedy, when freely and properly administered.

P.—Tell me now about the boy he mentions.

Dr.—His little boy is now a fine youth. When he came under my care, he was fragile and delicate in the extreme. The first thing I had to do was to unwind some four yards of sticking plaister from the ankle joint, which had been on some time, with *orders not* to be removed. I

found that sloughing or destruction of parts had taken place under this abominable bandage, leaving the tendons and bones of the joint exposed and *bare* as if they had been dissected. In such a constitution it was a very serious business. What he had been subjected to was worse than our old farriery, it deserved not the name of surgery,—although, it must be confessed, a kind of surgery once much in vogue. The ordinary treatment *now* of joint and spinal complaints is more rational than it used to be. I remember the time when it was barbarous. Let surgeons try the water-cure treatment in such cases, and they will never return to even their present *ameliorated* system.

In the case of Mr. Beale Browne's little boy it was highly satisfactory to see the quickness with which reparation took place under our *local* and *general* treatment. Simple water-dressing to the joint, and mild water-cure processes, such as I have already described to you, as fitted for so tender a subject, was all that was requisite for the cure.

If the boy had gone on in the way I found him, I have no hesitation in saying that he would have died. There is no surgeon of any practice who cannot recall many fatal cases of that sort.

P.—In reference to a remark you made about *joint* and *spinal complaints*, it is a comfort to know that reforms of practice do take place in your profession as well as in others, however slowly.

Dr.—Believe me, our profession is yet *very far* from being in a condition to cry out at, or cry down, *all novelties and innovations*, without a grave and *faithful investigation*.

Dr.—Here are two satisfactory notes, short and to the point; they are both from what may be called good patients, who assist their medical adviser in every way,—and they have their reward. Before I had the pleasure of their acquaintance, they had both taken more than their share of strong medicines, and had each undergone considerable *sharp practice* in that way. These gentlemen are very differently placed: the first has his time at his disposal, the other actively engaged in business. The latter turns over millions in the year, and is incessantly occupied, but, by drinking only water and following my injunctions, is remarkable for his *excellent health* and *good spirits*.

" *Leys Castle, Inverness,*
" *Dec.* 1853.

" My dear Sir,

" After considerable experience and observation, I have every reason for giving the water-cure treatment, judiciously practised, my entire approbation and best good wishes.

" Few patients, I believe, have read more works on the subject of hydropathy than myself. I have carefully observed the results of the practice on my many fellow-patients in your house, and have also visited other establishments.

" Before I determined to put myself under your care, I had suffered much illness for

several years, with little prospect of amendment, having fairly tried every approved method, well recommended to me, in vain.

"I have been entirely free from suffering, and in *the enjoyment of better health than I have known for years*, during the last winter, which I passed in your establishment, and, I must add, that it was also past most agreeably in a social point of view.

"It would be well if this *curative system* were better known by many who are perhaps now suffering as I was, and that your forthcoming work may contribute to this result, is the earnest wish of,

"My dear Sir,

"Yours most truly,

"JOHN FRED. BAILLIE."

"*Princes Park Terrace, Liverpool,*

"*Jan. 23rd*, 1854.

"DEAR SIR,

"I AM thankful in being able to say that many years have passed since I was an invalid, always suffering more or less, and in the words of Burke, making the 'extreme medicines of the constitution my daily bread.' It was in 1844 that I became your patient, and after passing through a course of treatment in your establishment, found myself so much renovated that I have not needed your aid from that time to this. Since then I have been, as a merchant, actively engaged in business, *and in the enjoyment of uninterrupted health.*

"Many of my friends, who by my advice have been persuaded to go to the water-cure, are now favourable specimens of your good care of them, and join me in warm advocacy of hydropathic treatment.

"With sincere regard,

"I remain, dear Sir,

"Yours faithfully,

"JAMES M'HENRY."

RECOVERY FROM PARALYSIS OF THE LOWER EXTREMITIES OF MORE THAN NINE YEARS' CONTINUANCE.

The account of this remarkable case I shall give you in the words of Sir Edward Bulwer Lytton, as he relates it in his "Confessions of a Water Patient."

He had heard of her extraordinary recovery, from another lady patient, and afterwards questioning me on the subject, I gave him her address, and told him that if he introduced himself as a friend of mine, he might call upon her, and make his own inquiries.

This statement was the result of his visit:—

THE CASE.

"The following is one of the many cases I witnessed when at Dr. Wilson's establishment, showing how much may be done by a scientific application of the water-treatment. It is that of a lady, who had had the lower limbs palsied for nine years, and who could, at the time I saw and conversed with her, walk well—and walk far. This was the more striking, and I have selected it more particularly, because the cure was effected without the aid of those adjuncts of *air* and *exercise*, in which some sceptics are in-

clined to place the whole benefit which hydropathic treatment confers. For the patient had recovered the use of her limbs, and was enabled to walk without assistance, before she had once quitted the two rooms which, for nearly six months, formed the magic limit of the cure. And, I confess, that I scarce know which I envy most, the delight of this grateful patient, or the pleasure and honest pride of Dr. Wilson in so signal a service to humanity, and so undeniable a trophy of his skill.

"The lady had passed the meridian of life, and it was not until the power of standing had returned, that she had any faith in recovering the use of the limbs, notwithstanding Dr. Wilson's confident assurances, from the first, that she would walk again; her only hope was benefit to the general health; and this, with the Doctor's assiduity, induced her to persevere until his prediction was fully accomplished."

P.—It appears almost as satisfactory as your first case, with the simple difference of "LIFE" being the question in the first, and "LIMBS" only in the last. Was the case a difficult one?

DR.—It was. It required considerable perseverance, with peculiarities calling for much antiphlogistic treatment by nearly daily sheet-packing. The lady had gone through in former years many very severe illnesses, which had left behind them a continued feverish condition, with a pulse seldom under 100. I observed also, that the power of the arms and hands was becoming very weak, clearly indicating the insidious approaches of a similar state of paralysis of the upper extremities. Otherwise she conversed cheerfully, and was able to take sufficient nourishment, when placed and propped up in her seat.

She fortunately obeyed me implicitly, but she had *no faith* whatever in recovering the use of the limbs, so that I frequently taunted her incredulity, by offering to bet a thousand pounds to a thousand shillings that I should some fine day see her *walking* about Malvern. She would not give me an opportunity of winning my bet, but made amends by a proceeding much more agreeable. She sent me, some time after her return home, a very handsome silver salver, with the following pleasing inscription. As no one has seen it for the last nine years, I will show it to you. It is one of the *water-cure trophies*, which Mrs. W—— "keeps in lavender."

"PRESENTED TO JAMES WILSON, ESQ., M.D., OF MALVERN,
BY SARAH B. PENNY, OF SOUTHPORT,
IN GRATEFUL ACKNOWLEDGMENT OF HIS ATTENTION, SKILFUL TREATMENT,
AND RESTORING TO HER, THROUGH GOD'S ASSISTANCE, THE USE OF
HER LIMBS, OF WHICH SHE HAD BEEN DEPRIVED UPWARDS OF NINE YEARS,
1845."

P.—Very nice and very gratifying; and I have no doubt a proceeding many doctors would say was worthy of all imitation. With such cases you may well bear with equanimity and *insouciance*, the taunts of prejudice and adverse opinion, as well as the falsehood and malicious slander that are always heaped upon all pioneers of new truths which interfere with existing beliefs, interests, or institutions,—or their several *abuses*.

FACIAL PARALYSIS, WITH BRONCHITIS, ETC.

DR.—The following is a very interesting case in one sense, being one of those that medical men, not acquainted with the water-cure, would at once say was utterly *unfitted* for it.

The patient wrote to me at the beginning of the *winter* of 1843, to inquire whether it would be worth his while to come to Malvern and try the water-cure for *a fortnight*, being all the time he had to spare, as he was ordered off to a warm climate, and intended going first to Rome. I advised him to come directly.

P.—I dare say you had the design of *arresting* his hap-hazard wanderings.

DR.—True. I saw at once, if he listened to reason, that something better was in store for a man in his dangerous state of health. There was nothing to be gained by his going to Rome; he had already been there to no purpose. There was every probability of his being laid up there, or on the way, with bronchitis, and, in his deteriorated condition, perhaps never to return to his numerous friends.

That was my view of the case, now hear the result, and what *he* has to say on the subject.

LETTER FROM THE REV. R. A. F. BARRETT, B.A., FELLOW OF KING'S COLLEGE, CAMBRIDGE.

"*Feb.* 10*th*, 1854.

"MY DEAR DR. WILSON,

"My account of myself is simply this. Having injured my constitution by long application to a literary work, at length, in 1852, I became affected with slow facial paralysis, and after I had tried most of the usual remedies without any effect, except of still further impairing my general health, I came to the water-cure. At the end of about a month I had received the most decided benefit, not merely for the paralytic affection, but also in my general health.

"In addition to the paralysis I had for many years suffered from chronic bronchitis, the least cold, irregularity of diet, or exertion of voice, invariably brought on acute attacks of inflammation, which only yielded to severe treatment, such as leeching, blistering, calomel, and antimony, and at the end of the time left me utterly prostrate and unable to speak, except in a whisper, for weeks often for *months*.

"By these repeated illnesses I have been reduced nearly to death's door. Since I have tried the water-cure, although I have not been what you call a good patient, by taking every care of myself, I have been much less subject to these attacks than before, and a degree of inflammation, which under the usual remedies, would require three weeks' of active treatment to reduce, and then leave me quite exhausted, is cured by your water-cure remedies in *a week*, without any internal medicine or weakening process. On this point I speak confidently, having probably had as many attacks of acute bronchitis as any one alive. Indeed, had I not tried hydropathy, I have reason to believe that I should before long have sunk under them.

"In addition I may add, that there is no place where I spend my time more pleasantly, and, as regards health, more profitably, than at your water-cure establishment.

"Believe me, my dear Dr. Wilson,

"Yours very truly,

"R. A. F. BARRETT."

P.—There seems no question as to the result of his trip to Malvern, however his second visit to Rome might have turned out. Do you find these cases difficult to manage or to cure?

Dr.—Not at all. I have had a good many of them, with all sorts of complications. In the present case, there was in addition to what has been already mentioned, a congested liver, and much injury of the stomach.

At the beginning I had recourse to fomentations, partial packings, alternating with gentle sweatings; also wet-sheet rubbings, and different baths, at various temperatures, according to the indication of the moment, until active irritation was reduced in the bronchial tubes, as well as in the digestive organs. He was soon able to go on with a steady, straightforward treatment.

By the end of the *proposed fortnight* he was convinced that he had found what he had wanted, and went through the winter here steadily improving. The eyelid and the muscles of the right side of the cheek and mouth were severely paralysed, and he was obliged to support the latter with his hand when speaking. As the treatment went on, these symptoms also gave way.

SUPPOSED CONSUMPTION, WITH EXTREME DEBILITY.

Ten years have now elapsed since the following letter was written. During that time the lady has had a family, and I have had the pleasure of seeing her on two occasions, when she paid a short visit to Malvern.

On my first interview the patient presented all the appearances of consumption rapidly approaching its last stage, but on examining the state of the lungs the signs of tubercular phthisis were wanting. There was no *pectoriloquy* or other signs of a vomica or ulcerated cavity. The *resonance* was sufficiently clear, with bronchophony, &c., showing the existence of a grave and long standing inflammation of the bronchial tubes. I therefore at once gave a favourable *prognosis*, and assured her of speedy amendment and in due time a *cure*. The following is her letter:—

"*King Street, Carmarthen,*
"*Feb. 6th,* 1844.

"Dear Dr. Wilson,

"If a brief account of my recovery by the water-cure will assist in removing ill-founded fears and prejudices, it is with great pleasure I send it you, to make any use of you may deem of utility.

"During a period of twelve years I was in a very delicate state, scarcely ever well, and incapable of bearing the least exertion. I was frequently laid up with severe illness for months. At last my chest became so severely affected, that I was thought to be in a rapid consumption. During this long period I was generally under medical treatment, often thought to be in a *hopeless* state, and I was at last told that the probabilities were against my living long or recovering. My husband was informed by some of my medical attendants that tubercles were formed in the lungs.

"I put myself under your care in a forlorn state and as a forlorn hope, and when,

after an examination of my chest, you told me that with proper management, care, and the necessary means, I should be free from disease, strong, and well, in less than six months, I confess that I thought at the time that you were flattering my faint hopes, and that it was next to impossible. I am thankful to state, that your kind opinion has been most truly verified, for I am now strong, and in the enjoyment of all the feelings of perfect health.

"Soon after I commenced your treatment, which, from my great debility, was at first of the gentlest nature, I began to experience its strengthening power and to feel more assurance that I should recover. I was soon able to bear and find all the remedies agreeable, and to the present moment I have every day had more reason to thank a kind Providence who gave me the benefit of the means you use, and of your skill and unremitting kindness. Mr. Charles joins me in kindest wishes for your welfare.

"Believe me, dear Dr. Wilson,

"Very truly yours,

"ANNE CHARLES.

"P.S.—I forgot to mention that from the day I consulted you, I have not taken, nor have I in any way required, a dose of medicine or a stimulant of any kind."

SUPPOSED CONSUMPTION.

This is another case of the same kind as the last, with this difference, that there were family reasons for dreading that tubercular consumption had set in, and that it was far advanced.

This gentleman, whose studies had been interrupted by illness for some years, is now a clergyman of the Church of England, doing active duties—and now married and has a family. When I last saw him he was a strong, robust man. It should be remarked that this patient came to Malvern at the commencement of *winter*, direct from a long residence at Madeira. The letter appeared in Mr. Lane's "Life at the Water-Cure." *

LETTER FROM THE REV. WM. SEALY TO RICHARD LANE, ESQ., LITHOGRAPHER TO HER MAJESTY, ETC.

"*Malvern, Oct.* 1850.

"DEAR SIR, (*Extract.*)

".... The delicacy of my own health had obliged me to pass many years in the Island of Madeira, but so little did that much-vaunted climate tend to restore my health, that I came here seven weeks ago in a state of *mind* and *body* which it would be vain for me to attempt to describe. I looked forward to the future with gloom and despondency. Gradually and imperceptibly a change took place—my spirits returned—my general health improved—and the morbid pains from which I had so long suffered began to leave me. I doubted the reality of all this, and thought that a few days would bring them back with tenfold violence; but such has not been the case. I am the astonishment of friends and others, and rejoice in the prospect of an *English winter*. I believe that with God's blessing the water-cure has saved my life. If I had not had recourse to hydropathy, what would have been my fate—a few months, perhaps years, of suffering with the feeling that recovery was hopeless. They would have then said,

* "LIFE AT THE WATER-CURE, OR A MONTH AT MALVERN." By R. J. Lane, A.R.A. *People's Edition*, 1*s.* 6*d.*; *First Edition*, 14*s.* SOLD BY B. LAMB, LIBRARY, MALVERN.

'Poor follow, he died of consumption.' With more justice they would have said, from the effects of blisters, croton oil, morphine, sulphuric acid, &c., &c. The poor unfortunate stomach and ganglions were completely overlooked, and you may well imagine how adapted the above-mentioned medicines were to aggravate any evil which existed there. When I see others around me progressing in an equal ratio with myself, I cannot but congratulate you on the good work which you have already accomplished, in extending the knowledge of the water-cure, and I heartily trust that your work may be the indirect means of relieving the sufferings of many. Already I have induced two much valued friends of mine to come here, and place themselves under the care of Dr. Wilson. That you may go on and prosper in the worthy cause you have undertaken, and that you may ever enjoy health and happiness, is the ardent wish of

"Dear Sir,

"Yours very faithfully,

"To R. J. Lane, Esq." "William Sealy."

USE AND ABUSE OF APERIENT MEDICINES.

Dr.—If the water-cure did nothing more than mitigate the injurious results of purgation as it is often practised in this country, it would be no small boon to society. The following case, as well as the following letter from Lord Anglesey, will illustrate my meaning:—

"A gentleman about forty years of age came under my care in July, 1849. He was a large powerful man, and until a close inspection was made looked anything but an invalid; I soon found, however, that he really was so. His conversation and thoughts from morn till night were about his digestive organs,—I could not walk or talk with him for five minutes, but with a heavy sigh he would involuntarily exclaim, "Oh, my poor stomach—and bowels!" the last words as if they issued laden with despair fronr the depths of the abdominal region. A word of sympathy would bring tears into his eyes at any moment, and be was as weak and nervous as any hysterical woman I have ever seen; yet in this shattered condition, if roused to an effort, he could have carried me in his arms like a child. He told me his history, as nearly as I can recall, in these words:—

"I suppose you don't think I look ill, but I am. I have been reading one of your works, which determined me on coming here; I am now so miserable that I would rather die if I can get no relief. Before the last three years I seldom ailed anything, when I began to lose my appetite, and to feel very heavy and sleepy, and sometimes in low spirits, but not in any way requiring the assistance of medicine. I was living freely, and a friend advised me to take a *Seidlitz powder every morning.* This I did, and was much better, so much so, that I thought I had found exactly what suited me. I took one before breakfast for several months, when pains in the stomach came on in about an hour, without relief, then I took another. At last I took two at once without much effect. At this time I was troubled with acidity and heartburn, and took *soda* a dozen times a day. I have taken pounds. One day I called at my druggist's, and he said he would prescribe for me *a warmer medicine,* and that the Seidlitz powders were too cold for the stomach."

P.—Something to comfort his "poor stomach and bowels," I suppose.

Dr.—Yes, more searching, griping, and drastic. He went on to say,

"He gave me a box of pills, three to be taken at night, and a mixture of *his own* to be taken in the morning. This I found to answer much better, but in seven or eight months I was quite ill, and could *get no action whatever* without medicine, and some-

times the *strongest failed* altogether. I had a little before this consulted the first advice in London, and since have been in the hands of nearly every man of note you can mention."

He then produced a huge packet of prescriptions, which he was anxious I should look over. Here I found the changes had been rung on every tonic and purgative, from calomel to croton oil, from gentian to quinine. Here was also creosote, with what intent I could not divine, and prussic acid, as well as a variety of narcotics. I should mention that his sleep was nearly gone, and when he did sleep, he said his dreams were so horrible that he dreaded going to bed. Here was a brain and bowels all but ruined by medicines and mismanagement.

I could without difficulty pick out a dozen medical men, who would at once call his case one of "*drug disease*"—and advise him,—not to go to the water-cure,—but for his life to avoid drugs and doctors, and seek repose at the sea side, or a farm-house.

I told him that it would be a tedious troublesome case to himself as well as his doctor, but that I would answer for his recovery. He replied, "If you can cure *me*, it will make a sensation, I am known to all the doctors, and I will go and show myself." I said, "Never mind, the majority will then say, you were a *malade imaginaire*."

Large and strong as he looked, he had no reactive powers; he was chilly in the warmest weather, and had inveterately cold feet. Here I found the value of hot fomentations to the stomach and bowels, and the gentle stimulation of the lamp perspirations, as a preparation for the different baths and ablutions. The organic powers were so exhausted, that the abdominal compress, which on most people is warmed in a few minutes, remained cold, and it was some time before he could use it. By the aid of wet-sheet rubbings, short sitz-baths, and foot-baths, during the day, and the morning warm-bath cooled to 60°, on rising in the morning, he soon began to progress. Every second day, sometimes, every third, he took the lamp-bath, with his feet in hot water, followed by a tepid-bath cooled down. By degrees I began partial packing, but it was some time before he could tolerate them. He did not like it; he said it produced the most sombre thoughts, and a feeling of mental irritation so violent, that it ended in his imagining he was fighting with some one.

At the end of five weeks, although his general health was much improved,—temper and sleep restored—with good reaction after the baths—still the bowels were obstinately torpid, and requiring gentle aid. I advised him to go away for a week, and take a trip down the Wye. On his return he was in great spirits, there had been evidence of a return of the natural function of the bowels. He continued the treatment for six weeks longer, during which he took the douche-bath nearly every day, with the greatest advantage. He was now all but well, and returned to London. He wrote to me that "he should never forget the lesson he had learnt, that he was *all right*, and that he might be seen every morning before breakfast taking his glass in Kensington Gardens."

LETTER FROM THE MOST NOBLE THE MARQUIS OF ANGLESEY.

Dr.—Since this letter was written I have often been consulted by Lord Anglesey. He always expressed himself highly satisfied with all the water-cure had done for him. He told me at our first interview that "it was almost incredible the enormous doses he had taken of the most powerful medicines, that it was only his strong constitution that could have survived the monstrous drugging he had gone through."

When, at a later period I was staying with Lord Anglesey, and when he no longer needed the aid of medicine in any form, he told me that at

my first visit, when I assured him that the water-cure would at all events do this for him, he could scarcely believe me, it seemed so improbable.

I believe I was the first who made him clearly understand, that his cruel tic had no connection whatever with the leg he lost at Waterloo.

P.—You have told me that a long continuance of *repose* from all excitement, was a very necessary element in the treatment of tic.

Dr.—Yes; and this was part of my prescription the noble Lord negatived. His general health was much benefited by the water-cure, and in his many letters to me they all end with its praises, with "*viva l'acqua,*" or something equivalent.

This is his kind letter, sent me to use in any way I thought fit, as a reply to the sinister rumours that were then afloat. The first six months I was at Malvern, the water-cure was laughed at, but by *this time* my success, and the exaggerated notices that appeared in several papers, of the number of my patients, produced a violent antagonism in some medical men, and startled them from their propriety.

"*Beau Desert, Oct. 8th,* 1843.

"My dear Doctor,

"I have your instructions conveyed in your letter of the 6th, and they shall be implicitly followed, as shall be also any other alterations you may be disposed to make in my treatment, being convinced (and this in the midst of much suffering), that if anything can relieve me from my most dreadful of all disorders, your skill, and zeal, and great experience and *prudence*, will bring me through. I mark this latter word more particularly, because I hear of the most absurd and malicious reports being abroad of your having very nearly killed me!

"*Quelle folie*, or rather, *quelle méchanceté!* Why, in general health I *never* was better than since you took me in hand, and I can declare that *since* the 21st of September, 1842, *I have never for a single day had occasion to assist, in any way whatever*, stubborn *bowels, which reluctantly yielded for years and years only to the most powerful and pernicious drugs.*

"It is true that to homœopathy I owe much, from having first taught me to abandon druggery; but then homœopathy had nothing to offer (me *at least*) in order to effect that which the free use of the pure simple water within and without, have, under your prudent and judicious management, so admirably effected. Still I am often in great pain—and no wonder;—a desperate malady that for six or eight and twenty years had been in full possession of me, and which has probably been immensely aggravated by the swallowing of a mass of the most violent and poisonous drugs—a quantity, which I do believe if noted down would not be credited. It is no wonder, I say, that even water cannot in thirteen months effect a cure. But it has kept me in excellent, and even robust general health, and if, instead of being seventy-five I was only fifty-five, I should not be without hope of your totally subduing the enemy; but as I shall probably hardly give you *time* to obtain a complete victory, I must continue to bear my malady with all the patience and resignation that I can muster. If I do outlive it (which, however, I own I do not expect), I shall owe it entirely to your system. So persevere, my good doctor, as you have hitherto done, and believe me you will find a confiding patient; and may you and the admirable system you have introduced into this country with so much talent, perseverance, and success, go on and prosper through good report and bad report.

"You will be glad to hear that Lady Adelaide is in high health, and a steady advocate of the water-cure, and I hear most favourable reports of Lord Lichfield. Lady Anglesey is tolerably well. We all send our best wishes to Mrs. Wilson, and

"I remain, my dear Doctor,

"Yours truly,

"ANGLESEY."

RHEUMATISM AND RHEUMATIC FEVER, ETC.

DR.—I have a particular reason for laying before you some of my old cases, with authenticated reports of patients, who have experienced the benefits of water-cure treatment a long time ago; it will be a matter of interest to you to know how such cases have turned out in the *long run*. I have also another reason of some importance. When such happy results as you find described and testified to, by these ladies and gentlemen, are made known to persons whose prejudices or interests are inimical to the success of the water-cure, they take refuge in sinister forebodings, and with *gravity* declare, that "such cures are all a delusion, or, admitting them to be cures, that they cannot last."

P.—Perhaps such an opinion, and strange mode of arguing, may be accounted for by supposing "the wish to have been parent to the thought?"

DR.—Whether it be so or not, such critics would evidently wish to have it believed, that all the ordinary sequences and laws of nature will be subverted to meet their party views.

P.—I must confess that I have frequently heard such remarks made with considerable energy, and apparent seriousness and candour, and have combated their glaring absurdity.

DR.—So have I, sufficiently often to exhaust a tolerable stock of patience. Humbug is vexing enough at all times, but a perverse, serious, or grave humbug, is doubly trying and detestable.

I will now lay before you some evidence of the results of the water-cure in rheumatism and rheumatic fever, gout, &c.

CASE.

Many years ago (ten or eleven) a gentleman arrived at my establishment and was at once assisted or carried up to bed. I found on examination that he had *rheumatic fever*, with *inflammation of the lungs*. He was very ill and in much suffering; the crepitus and dulness on percussion, indicative of inflammation, were distinct; the inferior portion of both lungs was engaged; the jelly-like sputa of a clear reddish-brown was abundant, and adhesive as bird-lime. After this examination, I remarked to the patient, that I was surprised at his having been able to reach Malvern in his condition; he replied, "I believe had I hesitated half a day longer I never could have started, but I was determined to try, if I died by the way." He went on to say, "I have suffered under rheumatic fever before, and was laid up in bed with it for *nine weeks*, and I assure you, it tried me pretty hard."

I found on further inquiry, that he had been for a long time rheumatic and in a bad state of health, and his digestive organs quite out of order; but notwithstanding this, and the

severity of the present attack, with the addition of the serious complication I have mentioned, I had him up and about his room in *nine days*.

P.—How did the matter end? Do I know this gentleman?

Dr.—Yes; he had a quick convalescence, and he is at this moment a strong, healthy man. You saw him enjoying himself on these hills last summer. The case is that of Mr. Dunn, late mayor of Coventry. I have no doubt he will give you a favourable account of his treatment, and of the water-cure, from his own personal experience,—as well as in reference to his brother, who, having been long in a deplorable state of health, was also completely restored by the water-cure.

P.—How do you manage *rheumatic fever* and *inflammation of the lungs* at the same time?

Dr.—In cases like the one I have mentioned, the same antiphlogistic treatment does for both. The steaming flannels are applied to the maladive organs in the abdominal cavity, and under the back part of the ribs at the same time, and this fomentation is repeated once, twice, or three times a day, as required, for an hour, an hour and a half, or two hours, the flannels being *renewed every eight or ten minutes*. The latter is of the greatest consequence, as I have already told you, when explaining the processes. Once or twice a day this is preceded by full or partial packing in the sheet, for an hour or more, followed by a shallow-bath at 85°, which is gradually cooled to 65° or 60°. The patient remains in the bath from five to ten minutes, not exerting himself, but well rubbed by the bath-attendant in the intervals of adding cold water. When the fomentation is not going on, a compress well protected is applied to the lower part of the chest, and embracing the stomach, liver, and bowels. The joints most affected, are also fomented and compressed.

P.—I see, it is very much like poulticing *frequently* a boil, or any inflamed injury, to disperse the mischief and ease the pain.

Dr.—You must perceive also how refreshing and gentle is the *derivation*, by the warm and tepid-baths quickly and gradually *cooled down*, and how we *let off all the morbid heat* and quiet the circulation of the *blood*; without taking it out of the body by pints or quarts, as we used to do, not long ago,—nearly as a matter of course. This is the simple way, by which we are enabled in these complications to do in *nine days*, or *less*, what often takes as many weeks. Besides, look at the difference of the patient *after* the two modes of treatment. He is quickly convalescent, and all the better for the water-cure remedies; on the other hand, see what he has to go through after the calomel, colchicum, leeching, bleeding, and blisters, &c. Why, nothing less than a long convalescence, and often, continued chronic disease, only waiting a time for another acute explosion.

P.—I believe from all I have seen, that is a true bill. But I wish you to explain how the steaming flannels and compresses applied merely to the skin, can get at the inflamed lungs?

Dr.—I am surprised you should ask such a question. How do leeches and blisters get at inflammation in parts below, with which the skin has no immediate connexion? Yet no one can deny the power of these applications in arresting inflammation in deep-seated parts. I had, not long ago, a case of *pure pneumonia*, or inflammation of the lungs, in a young lady of nineteen, that was completely cured in less than a week, I might almost say by fomentations and compresses alone. I should of course have used other adjuncts, had they been called for, but finding the recovery in this case so steady and rapid, and the patient so susceptible of the genial influence of fomentation, there was no motive for disturbing her by further measures. In twenty-four hours there was a change in the sputa and stethoscopic signs. I should not omit to mention that the fomentation was occasionally extended to the abdominal region, and that she drank a tumbler and a half, or nearly two tumblers of water every hour during the day.

THE CASE OF A PHYSICIAN WITH CHRONIC RHEUMATISM AND GOUT, AND TENDENCY TO MALIGNANT DISEASE OF THE STOMACH.

Dr.—The physician whose case follows, was under my care *eleven* years ago. He has since then sent me several patients. I have seen him, when I have visited London, looking remarkably well, and he is fully engaged as a busy practitioner.

THE CASE.

A talented physician, enjoying considerable practice in one of the suburbs of London, was the subject of this case. He is forty-five years old, during fifteen of which he has been afflicted with rheumatism and gout; besides which he has an hereditary tendency to black cancer of the stomach, his mother having died of that frightful malady. He had been constantly under treatment of one kind or the other, until his case was nearly hopeless, and his health so broken up as to oblige him to think seriously of abandoning his practice. An old friend of his, a physician* at the time under my care, wrote to him, advising him strenuously to try the water-cure, which he determined to do; but previously made a point of calling on two of the most eminent practitioners in London, who, as might be expected, ridiculed the idea, recommending at the same time a course of mercury and iodine. The patient having previously tried this with some disastrous results, and convinced, as he said, "that that was all that was wanting to *finish him off*," at once started for Malvern, where he arrived in the following condition. The body much emaciated; the trunk almost bent double; face pale, sallow, and anxious; cheeks sunken; tongue swollen to twice its natural size, furred and red at the edges; appetite morbid and capricious, leaning to indigestible articles of food; bowels torpid, with bad secretions; knees swoollen and painful,—one of them lame for several years past; lumbago; incapability of walking more than two or three hundred yards without great pain and exhaustion; considerable fulness and excitement about the head; little or no sleep, and what there was of an unrefreshing kind.

I shall merely mention that by careful management he was soon brought into a state

* Dr. Adair Crawford, the learned author of the article "Inflammation," in the Cyclopædia of Practical Medicine.

that allowed of the application of all the processes of the water-cure, even to the douche; and that, although there were many other drawbacks in the shape of mental excitements on family affairs, he left Malvern at the end of eleven weeks, standing erect, walking ten and twelve miles a day on the hills without fatigue, the lameness having disappeared together with the chronic swelling of the knees; his appetite so great as to require restraint, his sleep restored, and the bowels in perfect order. He left this about a month ago, highly satisfied with the results, and only regretting that his professional avocations obliged him to return to town, otherwise he would have preferred to continue the treatment throughout the summer. I venture to say that the change in his complexion and expression of countenance will be no small matter of astonishment to his metropolitan friends, both professional and laical."

P.—I am glad you cured the doctor,—a fitting triumph for the water-cure! It would be all nonsense, or rather humbug, to pretend not to know the fact, that your profession as a body *ignore the existence of the water-cure*, or as you say lend it a *deaf ear;* it is however gratifying to find that its safety and efficacy are made evident when their ailing bodies are submitted to its healing influences.

Dr.—I wish all the *sick doctors* who abuse and fail to appreciate the water-cure, would only give me the opportunity of changing their opinions by *practical proofs* of its *efficacy* on their *own bodies*, they would find how soon it would change the discord of their morbid organs into the harmonious action of restored health.

P.—It is a notable fact in proof of your position, that out of more than *fifty* medical men who have visited or been under treatment in your hospital, during the last twelve years, not one has come forward to inform their medical brethren or the public, that the water-cure judiciously practised is not what you and other water-doctors represent it to be.

Dr.—On the contrary, they have all become *converts*, and convinced of its scientific basis, intrinsic merits, and practical value—of its *simplicity*, *safety*, and *efficacy*. It must be acknowledged, the majority have been *silent converts*, probably from the pressing necessities of position, or private practice,—the absence of motive, or the want of moral courage.

RHEUMATISM, CONTRACTED JOINTS, ETC.

Dr.—The case which follows was to me a very interesting one, being the first of a deplorable rheumatic character, which I had to treat as a water-doctor. The lady is now married, and when I saw her about two years ago, she was as fine a specimen of robust health as you would wish to see; her only complaint being that she was too stout. This is the case as it was published ten years ago.

CASE.

A lady about twenty-six years old, well-known to Mr. Hodgson, a medical gentleman at Birmingham, came to Malvern in July for the water-cure treatment. She was in a state that we call in our profession "forlorn." The right knee and elbow were

contracted, without the power of movement, swollen and painful; the wrists nearly in the same state, and many of the fingers completely distorted. She had been brought by her long and severe sufferings to a state of extreme debility, and appeared *emaciated* and *bloodless*. All the functions were deranged and in the worst condition. She had not been out walking for nearly twelve months. She told me that her medical advisers had given a decided opinion, that "even if she ever recovered she would be a cripple for life." A few years ago I should have come to the same conclusion. From the impossibility of taking exercise of any kind, and the weak state of the patient, the treatment was commenced with tepid and chilled baths, after the packings, and sweatings; wet-sheet rubbings, fomentations, and compresses, &c. In a few weeks the *contracted knee* gave way, and at the expiration of two months she was able to walk up tolerably steep ascents, without any lameness. In the third month she had become stout and well covered with flesh, the colour of the skin and face completely changed, and all the functions of the body in healthy order. The elbow which I considered fixed beyond the chance of regaining its movement, is now beginning to give way. She also walks out in all weathers.

There is a feature in this case that should be noted, viz. that the patient had made rapid strides towards recovery, before she could take exercise or benefit by the fresh air of Malvern.

RHEUMATIC GOUT.

Dr.—The subject of the present case is an active officer in the East India service. His letter gives a faithful description of his case.

Malvern, Feb. 1st, 1844.

"My dear Sir,

"It affords me much pleasure to state, that the effect the water-cure has had on my *gout* and *general health*, has been most satisfactory. For the last seven years I have suffered as much as a man can well do, being often confined above a month to my bed, and afterwards continuing in a weakly state. This went on with other attacks of severe illness, until my ankles, feet, and left wrist, were permanently enlarged to double their natural size, and at the same time hard and painful. When I came to you I was unable to walk the shortest distance without great pain and fatigue, and my general health was worn out.

"During the long period of my suffering I had taken medicines of all kinds, in great quantities, which were given me by able and esteemed medical men. In a short time after I was under your treatment, I began to feel its beneficial effects; my strength returned, my appetite, spirits, and sleep became excellent, and the hard swellings of the joints diminished rapidly and visibly. I am now able to be on my feet the whole day, and walk a great distance with little or no inconvenience. The feet and joints are more than two-thirds less than when I commenced the water-cure, and are indeed but little larger than their natural size. I now feel that I have health and strength, and by following your instructions, and going on gently with the treatment, I feel confident my recovery will be permanent. In leaving you, I have to express my most sincere thanks for your kindness to me, and my conviction that it is to your treatment by the water-cure, I am enabled to *pursue* my *profession*, and have been saved from being always *crippled*. I beg to subscribe myself,

"My dear Sir, yours very faithfully,

"Alan Hyde Gardner."

P.—Such results are conclusive and highly satisfactory. When the

water-cure treatment finds its way into our hospitals, I expect the medical men will be able to publish no end of such cases in their reports.

Dr.—We must wait for that day with patience. It is only a question of time.

RHEUMATISM.

This patient was induced to try the water-cure by Colonel Wilmot, a resident of Malvern. He has been here since he was cured, accompanied by his family, to place his daughter under my care.

THE CASE.

Colonel V——— came into this neighbourhood for his September shooting, but, in a few days, was so severely attacked with rheumatism in the lower part of the back, the groins, and legs, as to oblige him to give up all his sporting engagements, and *lay himself up*. The same thing had occurred to him in *several previous years*, and had confined him more or less during the winter. When I saw him he complained of great and incessant pain; and when he attempted to walk he was nearly bent double.

During the first fortnight that I treated him, the pain, though severe when present, became intermittent, and there were intervals when he could walk straight. Still there was every appearance of its being one of those obstinate cases, which usually baffle all treatment. He was a good patient, however, and stuck to the plan of treatment I laid down for him, with perseverance. Before five weeks from the commencement were over, all pain was gone, both in the trunk and limbs; and he was able to walk as well as ever. A few days ago I met him at a *battue chasse*, at Lord Beauchamp's, at Maddersfield, where he took his share with us in killing a great many pheasants; and although the day turned out very wet, he stood it out, laughing at the idea of a return of rheumatism. His general health and appearance also underwent a very marked change for the better; indeed, his health may be said to be now perfect. The restoration of the general health being one of the *striking features of* the water-cure.

P.—I can easily understand what difficulties there must have been to surmount the prejudices and fears of patients and their friends, as well as doctors, when it was proposed to apply cold water and wetted linen in cases of rheumatism and gout, not forgetting baths, when in a state of perspiration. You, who flatter youself you have no prejudices, must allow, that these seemed very dangerous and unnatural proceedings.

Dr.—There is some truth in what you say; but when a great number of credible witnesses came forward to testify the perfect safety and extraordinary efficacy of the wate-cure treatment in such cases, then it became the business, as well as the duty of every *real* medical man, to investigate the matter for himself;—or, failing in this, to make a clean breast at once, and say, "I would rather it was not as it is represented to be, I would rather not burden my conscience with the additional load of this knowledge and conviction, *when I have pre-determined to oppose it*."

P.—I remember it was the same with mesmerism. You might have heard men of note going about vowing it was all an outrageous trick and a delusion, and that too, at a time when half the young boys and girls in

the country were familiar with ordinary mesmeric phenomena, those persons are often the most credulous, who cannot appreciate a self-evident fact—they will "strain at a gnat and swallow a camel."

Dr.—I dare say there was a time when you thought warm and hot baths of various kinds, just the thing for rheumatism and rheumatic gout; but how stands the matter in reality? Why, from all the many patients I have had under my care, and from all I have witnessed at the many German warm-baths I have visited, I have found that the *outside* and *inside heating* of rheumatic subjects, aggravated and *confirmed* their complaints, and made them more thorough invalids. On the contrary, the water-cure system of treatment, with its *cooling, refreshing,* and *derivative action,* improves their condition, restores the *digestive functions*—the making of *new blood,* and its *distribution*—and imparts additional vitality to the *nervous system* and the *skin*—this is quite enough for a *physiologist* to account for the *cure* of rheumatism.

GOUT.

Dr.—I have treated a great many cases of gout of all kinds; some of them as bad cases as could be found. Many of them bless the day when they discovered the water-cure; others, I know, have returned to drinking habits, or, what is nearly as bad, eating twice as much as nature requires. As a matter of course, with the return of gout, less exercise was taken, and the surplus provision *disposed of* with more *punishment* and *difficulty*. Some of these, repenting of their *sins against the organic laws,* have again had recourse to the water-cure, and have been again restored to a condition free from suffering, and compatible with the duties and *proper* enjoyments of life. There can be nothing more convincing and satisfactory to a medical practitioner, than to mark the reparative effects of a judicious course of water-cure treatment in a bad crippled case of gout.

P.—Does it cure gout?

Dr.—Priessnitz told me that, out of a *great many,* he had only *cured* one; if he had said he had every reason to suppose so, perhaps he would have been nearer the mark. From my past experience, I think it probable if this patient had returned to regular gouty habits, he might have found that the enemy, though diven out of the citadel, was still in ambush.

P.—Well, in the name of goodness, if the patient thinks he is cured, and the doctor thinks so too, they may surely both be well satisfied.

Dr.—About *eighteen* years ago I had a genuine attack of gout, which came on in the mail from Liverpool to London, after a course of hospitality, comprising an unlimited supply of madeira, port wine ("without a headache in a hogshead"), and brandy and water *ad libitum.* I entered my house in town without a boot on, but with a *great toe* not to be easily forgotten. I have taken care not to have gout since.

The following was the first case I treated by the water-cure. I found him in a condition requiring his two footmen to carry him up and down stairs. As a proof that he continued satisfied, he sent me more than a year afterwards, a valued friend all the way from Italy, who was then supposed to be a dying man. It was Admiral Beauman, whose recovery was rapid, and very remarkable.

CASE OF GOUT.

"*Malvern, Sept. 16th*, 1842.

"My dear Sir,

"I cannot leave Malvern, without again expressing to you my thanks for the encouragement you gave me to try the effect of the water-cure, as you practise it, and for your kind attention to me during the time I have undergone the treatment.

"I have now gone through the perspiring process, followed by the baths fifty times, with the other parts of the treatment; I found them anything but disagreeable; indeed, I may say, quite the reverse; and they have been most beneficial to me. During nine months before I came here, *I was never able to move without my crutches*, and a great part of that nine months, *I passed in my bed or on the sofa*. My nights were restless, my pulse high, and my tongue charged. I am now turned sixty-three years of age, and have been subject to the gout more than forty years. I paid little attention to it the first twenty years, and as soon as the fit was over, I never missed taking my wine daily. My knees, hands, and other parts were so crippled, that I had made up my mind to pass the rest of my days *in my arm-chair or bed*, or to hobble about with my crutches.

"The effect of the treatment has so ameliorated my situation, I can now go up and down stairs with ease and comfort, *without a stick*, and the other day walked half a mile on the high road. I frequently ride on horseback four hours a-day, and my general health, I thank God, is as well as ever it was in my life. I sleep well, my appetite is good, I can use my arms freely, and tie my neckcloth, a thing I had not been able to do for years; in fact, *I feel myself comfortable and independent*. Had I come here a year ago, and undergone the same process, I have no doubt but I should have saved my left knee from being contracted: as it is, I am content to walk a little lame, and shall be too happy to remain in the same state I am in at present for the rest of my days. Pray excuse this long scrawl, as I know you have not a minute to spare, and

"Believe me, my dear Sir,

"Yours most truly,

"T. C. Marsh."

Dr.—I had a letter a short time ago from an experienced gouty patient, who had really suffered a martyrdom from it,—he makes the following observation,—"I should have no objection to live a hundred years with any kind of gout, only give me my lamp-bath, and an occasional dose of castor oil, a Dr. Petro-Positive to order away forbidden dishes, and my old bath-man to make me turn out after my bath on fine mornings."

GOUT.

"*Little Malvern, Jan. 27th*, 1844.

"Sir,

"For seven years I suffered with the gout; it went on worse every year, until I became quite a cripple, and at last I could not go about at all. I had good advice from many physicians, and took medicines regularly from them all; but I became very weak

and ill of myself, and could find no rest night or day. In this state of suffering I went under your care—it is now thirteen months ago—and went through your treatment for seven weeks. I have been now twelve months without gout or pain of any kind, my looks are quite changed, and I feel like a healthy man, and can do anything. I took no medicine when under your care, and have not required any since.

"I am butler to William Berrington, Esq., and I may thank you for having been able to return to my place, and for saving me from being a cripple for life, and for curing me without any payment.

"I remain, Sir,
"Your obliged servant,
"JOHN FOYLE."

GOUT.

"*Acton House, Acton,*
"*7th Feb.*, 1844.

"MY DEAR SIR,

"Experience has so fully convinced me of the good effects of the water-cure, that I feel no hesitation in complying with the request contained in your letter, but have great pleasure in adding my testimony in support of its efficacy. *Eighteen months* have now elapsed since I commenced the trial under your direction; previous to that time I had for years suffered dreadfully from gout, of which I had frequent attacks; indeed, I was very seldom and only for *short intervals free from them.* I was also much annoyed, I may say incessantly, with acidity of the stomach, heartburn, headache, giddiness, and other distressing symptoms. By strictly following your rules, and without the aid of a grain of medicine, I have been long since relieved from them, and all similar inconveniences, not *partially* or by halves, but *wholly* and *entirely.*

"About a year after I left Malvern, I had a fit of the gout while making a little tour of the Lakes, but I may, I believe, attribute it to over-confidence; I fancied and flattered myself that the disease was eradicated from my constitution, and I therefore neglected the warnings that preceded the attack. Since then I have enjoyed perfect health, and can walk fifteen or twenty miles without any apprehension of suffering for it afterwards. I think, and indeed know, that mischief has occurred to individuals by *misapplication* of the water treatment. Some expect wonders to accrue from drinking two or three tumblers of water before breakfast, and should gout appear, they have recourse to cold applications, without undergoing any kind of preparation, or using any *precaution.* Hydropathy then is sure to be *accused* and *abused*, and such cases I have heard quoted to raise prejudices against it. I am perfectly convinced that under *judicious* management the water-cure is a safe cure for gout, and I shall be always ready and happy to promote its adoption by every means in my power. I think, my dear Sir, that all who have experienced its benefits, owe you a great deal for having first introduced the practice of it into this country. I freely acknowledge my obligations to you, and remain always,

"Yours most faithfully,
"GEORGE LYNCH."

STOMACH COMPLAINT, WITH CONGESTED LIVER, HEADACHES, AND CONSTIPATION.

DR.—My reverend friend, has kindly permitted me to use his name *privately*, so as to enable me to insert his letter in this *authenticated*

evidence. It represents the case and sentiments of a numerous class of "water patients."

LETTER FROM THE REV. ———

"My dear Sir,

"It is about the time for me to let you know how I have been going on. I am truly happy to be able to assure you that I still continue to feel, and most highly to appreciate, the beneficial and extraordinary effects that were produced in me during my short stay with you. I am almost at a loss for words to describe the difference between the state in which my health now is, and that in which it was when I first submitted myself to your treatment. I could hardly have imagined that so great a change could have been effected in so short a time.

"I continue to feel strong, vigorous, and active, and my stomach is in excellent order; there has been no return of those *severe bilious headaches*, from which I used to suffer so much, and instead of being exhausted by moderate exertion, I can now walk the whole day without being fatigued. I shall go on following your advice and prescriptions until you consider me radically cured.

"Since my return, I have been somewhat amused by the vague notions and diversified opinions I have heard expressed on the subject of the water-cure; some seem disposed to think well of some parts of the system, but all are staggered when I tell them of the wet sheet—the invaluable and wonderful wet sheet, I call it. Many hardly credit me when I say that I was enveloped in one for an hour nearly every morning during my stay at Malvern, and that *I found it positively a matter of enjoyment.* In the conversations which I am likely to have on this subject, it is very likely that objections may be brought against the system, which for want of theoretical knowledge, I may not be able to answer satisfactorily. No arguments on earth, however, can undermine the truth of these plain facts:—*that I went to Malvern weak, nervous, and depressed from long suffering, and after a short stay, left it strong, vigorous, and cheerful; that amongst my other ailments, my stomach was extremely weak and bilious, and that when I came away, it was strong, and in excellent order.*

"I should be glad to hear from you when you have leisure to write to me, and in the meantime shall go on according to my instructions. I will only add, that I enter fully into all your philanthropic disposition anticipates from the general practice of the water-cure, and I am truly thankful for having had the opportunity of experiencing, under your direction, the benefits of this most beautiful system—a system so perfectly in harmony with *dictates of nature* and *common sense.* I shall always remember with great pleasure my short but delightful visit to Malvern, and the kindness I experienced at your hands. Pray make any use you please, *privately*, of my name and address, that can aid the good cause; and believe me,

"My dear Sir,

"Yours very truly,

"——— ———."

NERVOUS INDIGESTION, ETC., WITH SUICIDAL PROPENSITY.

Dr.—The Rev. Stuart Majendie was a patient in my house, at the same time with the patient whose case I shall now relate.

CASE.

The subject of this distressing malady was a gentleman of forty-six years of age, who after eighteen years of active and incessant attention to commercial affairs, retired with

a moderate fortune from them in consequence of the growing distress both in the *stomach* and *brain*, which unfitted him for further action, and, as he said, "rendered the sight of the ledger intolerable." It avails not to repeat all the means he had tried previous to his trial of the water-cure; suffice it that they comprised all the circle of medication, and, what is for the most part as bad, *drug dietetics*, by which is meant the system of keeping up a certain amount of stimulation from food and wine on the condition of maintaining a proportionate amount of stimulation from medicines. He came here complaining that he only got one hour or an hour and a half of sleep in twenty-four hours, that he had the most horrible mental sensations, the predominating one being *that he was doomed to be his own destroyer:* indeed for the last two years he had never been left without some one to watch him. His bowels always costive and his belly protuberant, no pain was present when they were pressed; but *eating* always brought on a more intense degree of the *mental pain*. His volition was quite gone, and his moral courage extinguished. The contents of the chest were perfectly sound.

I commenced the treatment of this case with hot fomentations to the stomach and bowels at bed-time, the wet-sheet bath in the morning and evening, a sitz-bath in the middle of the day, and he also commenced lying in the wet sheet; the result of which was, that on the fourth night he had five hours' sleep. From the bowels too he had on the morning following this a good natural evacuation. The mind, however, still held by its painful sensations. He now began to lay every morning from one hour to one hour and a half in the wet sheet, followed by a bath; the sitz-bath at noon and the wet sheet bath being continued. During this time he went every morning walking on the hill, and drank from three to six tumblers of water as he felt inclined. In the course of the day he drank from eight to twelve tumblers, taking exercise, which varied from five to ten miles a day. At the end of eleven weeks he left Malvern perfectly recovered, having, during the latter half of that period, used the douche daily, and broken upon the wet sheet by occasional sweatings in the blankets. His capability of taking water increased with his progress towards health, and he sometimes took fifteen or twenty tumblers a day. The changes in the expressions of his face indicative of that in his feelings, was striking to all the patients in my establishment, and from being the most lugubrious he became the most laughter-loving of them all. *He slept invariably from the time he went to bed—ten o'clock—until the servant awoke him in the morning; and his sleep was dreamless.*

The only evident crisis in this case was an increased action of the bowels for a fortnight, carried to the degree of diarrhœa for two or three days, but without any pain, griping, or debility. The wet sheet, however, in which he lay for a long time rendered the water in which he was washed dark and turbid, with a copious flocculent sediment.

Dr.—Here is a case in which during two years the patient had been gradually getting worse, notwithstanding that he had obeyed, as he said, to the letter, every system of treatment he had followed, backed by perfect rest of mind and body. It is plain that in such fearful states of irritation of the nerves of digestion and of the brain, all internal medicinal means should rather exasperate than alleviate, and such was the fact in the present instance. Yet by the soothing operation of the local fomentations and the general application of the wet sheet, an almost immediate effect was produced upon that irritation, as the sleep and rapidly increasing quietude of mind testified. The same remedies, by thus reducing irritation, and conjoined with the derivative effect of the sitz-baths, succeeded at an early stage in setting up a regular movement of the bowels. Having thus

secured the quiescence of the nervous system, and restored the regularity and quality of the secretions and excretions, it only remained to renovate the tone of the system, which was effected most completely by the douche, and the appropriate union of the previously named remedies. It will be remarked that the diarrhœa here served as an *internal crisis*, of which mention has been made in the previous pages. But although this did not continue for more than four days, there were for as many weeks from two to three copious natural evacuations every day; and it was a curious feature, as told me by the patient himself, *that the less he ate the more copious was the evacuation*, a fact of which he convinced himself by repeated experiment.

CHRONIC INFLAMMATION OF THE STOMACH, WITH CONGESTION OF THE LIVER, CONSTIPATION, AND SLIGHT CONGESTION OF THE BRAIN.

Dr.—I was afraid I should not have found room for the following long letter, having already exceeded my proposed limits, but it is interesting in many respects, as showing how quickly in some constitutions marked relief is afforded by this simple treatment. It is also interesting as showing how, without care, a relapse may be produced before a complete cure is effected. I warned the patient before he left me to be on his guard, and that I did not yet consider him in settled health. Had he not had the good fortune to correct the error, and resume the water-cure treatment, his opinion at this day would have been, most probably, the reverse of that so warmly expressed in this letter.

LETTER FROM THE REV. JOHN LUMB.

"*Eastnor House, Malvern,*
"*Feb. 18th*, 1854.

"My dear Dr. Wilson,

"I do not think that *any one* of your numerous patients ever had more cause than I have, to bear a loud, cheerful, and lasting testimony in favour of hydropathy. This, I have never ceased to do since I left your establishment in September, 1851. In the month of August of the same year I entered that establishment (as you well remember) one of the most wretched of the wretched, as to my feelings, and left, after a course of treatment of only *five weeks*, in spirit, one of the gayest of the gay.

"Often, and deeply have I reproached myself since then, for not having testified to you in writing (except in general terms, in a brief note or two), as to the amazing—I had almost said miraculous—benefit I derived from hydropathic treatment under your kind care. But, if I have failed in this respect in regard to yourself personally, I have been anything rather than guilty of withholding from society generally, 'how great things God hath done for me,' through the medium of the water-cure. In this letter, I desire to record a few simple facts; and if they, from my own pen, can be in *any* way employed, so as to encourage the fearful, and cheer the desponding, who may *now*, or who may hereafter, be under your care, the great end for which they are thus placed at your disposal will be answered. In a few short sentences permit me then to describe

the state in which I first came to Malvern. This I will do as briefly and as truthfully as I can.

"Often have I asserted it, *vivâ voce*, and now repeat it on paper, that for eighteen months prior to submitting to hydropathic treatment, I do not think I enjoyed *one hour* of *continuous* cheerfulness! I enter not into the causes either of bodily or mental suffering, but the chief foundation of both was unquestionably laid in repeated, and severe illness during a residence in Madras, as a missionary, and a relapse, during the return voyage to England. When I came under your care first, I suffered intensely from nervous depression. Preaching was a most painful burden; books were of no use to me, as I was unable to fix my attention, and what I did read passed away from my memory immediately.

"An ordinary note of friendship or business was quite a labour for me to write, and many a time have I laid my pen down upon my half finished sentence and wept because unable to complete it! On matters the most trifling, whether personal or relative, I was tormented with an indicision which I could not overcome. In things sacred, as well as in things secular, fears the most groundless harassed me perpetually. A deep, and as I thought, settled and permanent gloom, seemed to enshroud all the realities both of this world and the next. For at least twelve years I had been obliged to *depend chiefly on aperients;* and for three or four years had experienced great inconvenience from hæmorrhoids. Even in summer I suffered from cold feet, and in winter was obliged to seek relief at night by sleeping either with my feet wrapped in flannel, or resting against hot water-bottles. Notwithstanding this, it was a very frequent thing for me to lie in bed unable to sleep till two, three, and even four o'clock in the morning. My sleeping hours were often more distressing than the gloomy hours of my useless days, being full of night-mare horrors, and dreams of events and scenes so frightful, that the painful impression often followed me like a spectre for days, and at times I was ready to believe that such frequent recurrences of this kind could be nothing less than premonitions of some sad impending calamity. No one could wonder that in such a state as this I should shrink from society, creep into solitude, and grow misanthropic—all which I did, and was in constant apprehension that I should quite lose my memory if not my reason!

"During this period, I was all but persuaded, that the heart and the brain were organically diseased, and that nothing but either an early, and perhaps sudden death, or life of protracted and deep depression awaited me. An excellent and pious physician, then in Southampton (near which I resided previously to settling at Malvern), who had prescribed for me continually for several years, said to me at last, 'I have studied your case most earnestly, and have prescribed for you everything I can think of likely to benefit you, and my conviction is this, that medicine will not touch your case at all, but, I do think that if you will place yourself under the water-cure you may get well.' After much persuasion, I yielded—I entered your establishment in the state described. I remember your candid and encouraging opinion, which has been so truly borne out, as well as your description of the state of my brain, and digestive organs, and of my tongue, which was nearly twice its natural size. Telling me also that much would depend on my following your prescriptions to the letter, but that if I did so, you would answer for my speedy recovery. And you were right. To my amazement, in three weeks my depression was all gone. From that time I slept as soundly as a labourer; all within was serene, all without pleasing and cheerful, and I can only convey my impression by saying, that I seemed suddenly to have been transported to a new and happy world.

"In three weeks one *inveterate ailment* was quite removed, and from that time to this, I have taken *nothing* in the form of *pills* or *draughts*, except on one or two oc-

casions a tea-spoonful of castor oil. During the previous twelve years, I should think, without exaggeration, I had swallowed a pound of pills, and some gallons of mixtures!

"But while gratefully acknowledging my mercies, I would (for the caution of others) honestly confess my faults in what followed. I left Malvern with a gladsome heart, feeling and acting as if then nothing could hurt me. Instead of quietly returning home, as advised, and steadily and progressively getting into ordinary duties as a minister of the gospel, and teacher of the young, I rushed into a series of successive missionary meetings—to me of great interest and excitement:—new undertakings, involving much responsibility and anxiety were entered upon—hydropathic laws were broken—and I had a relapse. I tried partial treatment, without much advantage, and therefore resolved to seek your aid again. At the expiration of a short course of treatment, I was again quite restored, and from that time (April, 1853) to this (February, 1854), I have been in the enjoyment of perfect health.

"Experience is a good teacher, and I have learnt, I hope, a valuable lesson. Often have I said in conversation, and now repeat it, next to preaching 'the everlasting gospel,' had I to choose, my subject would be hydropathy. Pastors of churches, and evangelists at home, as well as missionaries abroad, would by its remedies and the health and strength it gives in a *multitude* of cases, be equal to *double* their ordinary amount of work, with *less* fatigue and exhaustion than now. Private Christians, feeble in body, and desponding in mind, would become cheerful in spirit, earnest and successful labourers in the vineyard of their Lord.

"With such an experience as I have had of the value of a system which you, dear Sir, have so long and so successfully laboured to promote—and with such convictions of its yet *unknown* value both to the church and the world, you will not wonder at what some might call the enthusiasm,

"Of your much obliged,

"And faithful servant,

"JOHN LUMB."

STOMACH COMPLAINT, WITH GREAT SUSCEPTIBILITY TO TAKING COLD, ETC.

DR.—The lady who wrote the following letter was sent here by Dr. Begbie, a physician of talent at Edinburgh, but *not* to try the water-cure.

"DEAR SIR,

"In compliance with your request, that I should give you a sketch of my case, I beg to say that I have been for many years annoyed with a liability to take *severe cold*, with a cough that continued for weeks, and sometimes *months*, more particularly the last two years, *when* I was never more than a week without it, and closely confined to the house from *October* till *June*, never being able to go out without catching fresh cold, however warmly clothed, and even *latterly* in going through the house if the weather were at all damp. The usual mode of treatment was *medicine*, mustard poultices on the chest, leeches, and rubbed with irritating liniments; sometimes fly blisters, and every cough mixture, and lozenges,—all that could be thought of was tried, warm drinks, &c., and generally several days in bed at the commencement of every attack of cold. Occasionally the cold affected the wind pipe more than the chest, which made the cough at those times incessant. A complete change to *bracing* air having been recommended, induced my friends to bring me to Malvern, but not to try the water-cure; but it had *not* the *desired effect*, as I was attacked with a severe cold, similar to what I usually felt, and had I not consulted you, must in all probability have been confined to

the house for some time, as going out always increased it. However, you advised the packing in the sheet twice a *day*, and rubbing three times *each day* with the chilled wet sheet, wearing a warm compress constantly on the chest, hot fomentations applied to the stomach for two nights, drinking cold water, &c., and walking out three or four times a day, which treatment I followed, and at the end of *three days*, the feeling of cold in the chest was *quite removed*, and by the sixth day, the cough *completely gone*, which indeed appeared quite like a miracle, and thoroughly *convinces* my friends and myself of the extraordinary efficacy of the *water-cure*. I now go out without a thought about the weather or fear of catching cold.

"I remain, yours sincerely,

"ELIZABETH S——T."

DR.—In the whole range of medical treatment, there are no remedies that can produce such results as those mentioned in the letter you have just read. We all know what a *slight cold* often leads to, and how invalids go on from one system of coddling and muffling to another, until it often ends in serious mischief. This lady tried "*change of air*" and *Malvern air* in vain, until in despair, she added a gentle course of *water-cure* treatment to the above valuable adjuncts.

STOMACH COMPLAINT, WITH NERVOUS INDIGESTION AND SYMPTOMS OF CONSUMPTION.

DR.—The writer of the following letter, the Rev. Mr. Marshall, had suffered for a long time many of the symptoms preceding rapid decline, and it was expected that he would have been obliged to retire from the duties of the Church.

Cases of this kind are frequently met with on the Continent, where the subjects of them go in search of health. At Rome and in other parts of Italy, I saw many such, and amongst them a number of clergymen going on from bad to worse, the *appetite decreasing*, the *strength lapsing*, the *tone of the skin becoming less and less*. These cases often commencing in mental work and irritation, lead on to derangement of the stomach and bowels, are accompanied with *stomach cough* and extreme readiness *to take cold*, and not unfrequently terminate in substantial disease of the lungs:—a conclusion which is seldom prevented by the system of remedying they too often go through, which, on the contrary, leads to *hotter rooms, warmer clothing*, more stimulating drinks, and additional *chilliness and debility*. It is really quite melancholy to see many of them in Italy—far from their friends and their occupation—shivering at the bare thought of the bracing and healthy winter of their native isle, and feeling actually more cold than their countrymen on the banks of the Thames.

THE CASE.

"MY DEAR DOCTOR,

"It is now just a year since I consulted you at Malvern. I had been out of health for many months, and tried various remedies in vain; there was then every appearance that I should be obliged to give up my public duties, and seek refuge in a warmer

climate. Since I left Malvern, I have been in perfect health, and have not had an hour's illness, *a thing I had not known for several years previously.*

"I feel it due to the *system* and to *yourself*, to state that your treatment has fully realized all you promised; for the last twelve months I have been more equal to my public duties than at any other former period of my life. During the winter I *went out* in *all weathers*, and at all hours, and *never once took cold.* I have not taken medicine of any sort or kind since I saw you. I never can be too thankful for the benefit I have derived from the treatment. With best wishes,

"I remain, my dear Sir,

"Very truly yours,

"W. K. MARSHALL."

DR.—This case is in many points like the former one, and resembled that of the Rev. Richard Barrett already laid before you.

ASTHMA, WITH STOMACH AND LIVER DISEASES, ETC.

DR.—This was a very interesting case; he had been a long time in India, and his constitution was much shattered. He had given all the most approved modes of treatment a fair trial before he came under my care. He has written to me several times since the following letter, always expressing himself most grateful for his good fortune, in having discovered the water-cure:—

THE CASE.

"MY DEAR SIR,

"It affords me the greatest pleasure before leaving Malvern to add my evidence in favour of the admirable system you practise, and my thanks for the kindness and attention with which you treated my case.

"I have been upwards of eleven years in India; in the year 1836 I returned home, on leave of absence, and had a most severe attack of influenza, and have not been well since. I returned again to England in May last. I had stomach *asthma*, and *spasms* of the stomach in their severest forms, with indigestion and *constipation of bowels*, and torpid liver of many years standing. I was treated with bleeding, leeches, blisters, and medicines, but all my symptoms returned again with the same severity. I then tried the *mineral waters* with no benefit, suffering two severe attacks while taking them; in this most miserable state, I determined to place myself under your care. I am in every way more than satisfied with the result. After from three weeks to a month's treatment I met by accident your neighbour, my friend the Rev. Mr. ———, who did not recognise me with my altered appearance. When I came to you in August, I was clothed in flannel and wore a great coat, and was still chilly and cold, now in October I am without flannel, wear a single light coat and am warm and comfortable.

"I had what is called a crisis, and a severe one; the phenomena attending it would not be believed by many without witnessing them, but I felt perfectly well at the time, ate heartily with an appetite three times a day, and took plenty of exercise with alacrity. A friend of mine, Captain ———, whose case is well known to all in your establishment, had a crisis at the same time; it was considered one of the most formidable that occurs, yet I observed that his *gaiety* was not diminished, and his general proceedings as little disturbed as my own.

"So great has been the benefit I have received, and so convincing are the many proofs I have witnessed of the extraordinary benefits to be derived from the water-cure treatment *fairly* carried out, that it is my anxious wish to see others under similar

suffering avail themselves of so certain and safe a cure. Wishing you many years of health to continue your present employment, so eminently for the service of others, I have great satisfaction in subscribing myself,

" My dear Sir,

" Yours very faithfully,

" J. Douglas de Wend,

" Captain 44th Regiment."

STOMACH COMPLAINT, ETC.

LETTER FROM THE REV. STUART MAJENDIE.

" *Longdon, near Lichfield,*

" *Feb. 5th,* 1844.

" My dear Sir,

" I assure you that I very much regret missing you when you were on your visit to Lord Anglesey. I was obliged to go to the assizes, and on the day I was asked to meet you at dinner I was engaged.

" I am glad to find that the English public are becoming sensible of the value of the hydropathic treatment, and that your zeal and efforts have been crowned with so much success. It affords me pleasure to add my testimony to the many which you possess of its salutary efficacy. It is now about twelve months since I was under your care at Malvern. From that time I have continued to follow your instructions, and certainly have never felt so well. Should I be afflicted with illness, I should again seek health by resorting to my 'water doctor.'

" *Since I first consulted you, I have not taken, nor indeed have I felt the least necessity for any medicine whatever.* It appears to me, therefore, that when the water-cure is studied and cultivated by physicians of talent, and the misapplication of its powerful means avoided, by being taken out of the hands of inexperienced and unqualified persons, it will prove a great blessing to the community. With kind regards,

" Believe me, my dear Sir,

" Yours very sincerely,

" Stuart Majendie."

NEURALGIA, WITH STOMACH COMPLAINT, ETC.

LETTER FROM J. CAMPBELL, ESQ.

" *South Hall, by Rothsay,*

" *Jan. 9th,* 1844.

" My dear Doctor,

" According to promise I write to report progress, and let you know how I have been going on.

" You will be glad to find that since I was under your care, I have not had a pain or an ache. I have left them all behind me; indeed I may say I have not felt so well or so strong for many a day as at the present moment. I almost wish I had a twitch or two, that I might have an excuse to return to Malvern and your hydropathic treatment, which I tell all my friends, I found as much a matter of enjoyment, as it was beneficial. The water-cure is gaining ground in Scotland, and I am convinced it will do so, *the more it is practised and understood.* Believe me, my dear Doctor,

" With sincere regard,

" Very truly yours,

" J. Campbell."

TIC-DOULOUREUX, CHRONIC RHEUMATISM, AND NERVOUS DEBILITY.

LETTER FROM THE REV. J. P. COOKE.

"*St. John's College, Waterford,*
"*Jan. 26th,* 1844.

"My dear Sir,

"I have now had an opportunity of testing the power of the water-cure treatment, which I went through under your care. For the last three months we have had an almost uninterrupted continuance of that damp weather which for a long period used invariably to be a season of much suffering to me, and it is therefore with much pleasure that I acquaint you with the permanence of its efficacy.

"When I first put myself under your care, I had been for more than twenty years suffering from what I was told was chronic rheumatism, and consequent and daily increasing general debility. The night before I went to Malvern, my state of suffering was very great, and it was only by the most determined effort and exertion that I could cross the room. After the first ten days' treatment my strength began to return and my pains to disappear; and the happy effects have become daily more sensible. Under the Almighty Providence, to the water-cure, and your skilful administration of it, I owe this unexpected blessing, for I had in vain tried, I believe, every kind of remedy which medical advice could afford. It is no wonder, if from the benefit I experienced in myself, and that which I saw in so many others of your patients, that I should look upon the water-cure as a blessed revelation made to man in these days of scientific research and discovery. I know enough, to feel authorised in recommending this admirable system of treatment to all sufferers from disease, and feel assured it cannot be harmful to the most tender frames or most delicate constitutions, but must be productive of relief in almost every disease when scientifically administered by qualified practitioners.

"Of your kindness and attention to myself I shall ever have a grateful recollection, and to your skill, candour, and liberality, shall always be happy to bear ready witness.

"I remain, my dear Sir,
"Yours very truly,
"J. P. Cooke."

SLIGHT PARALYSIS, WITH EMACIATION, ETC., TREATED AT SEVENTY-FIVE YEARS OF AGE.

Dr.—This case shows what may be done by a careful and modified system of treatment. The patient came from Richmond, and insisted that something should be done for her; during the time she was under the treatment here, she lived at the Library.

CASE.

"The lady who is the subject of this case came here eight months after a slight *attack of apoplexy*, which left her with the following symptoms. Partial loss of voluntary motion in the lower extremities, occasioning an uncertain and shuffling step, gradually increasing up to the time she came here. Considerable thinning of the legs, and almost total disappearance of the calf. Permanently cold feet. Speech altered and difficult. Tongue red and dry. Bowels obstinately bound, yet purged violently with three or four grains of compound rhubarb pill. Sleep disturbed. Occasional giddiness. Pulse large, hard, and bounding, and varying from eighty-five to ninety beats in the minute.

The treatment was commenced by warm fomentations to the stomach and bowels,

from three quarters of an hour to an hour night and morning. After the morning fomentation, she had a general ablution with a wet sheet, taken out of water at about 85°. She slept well the whole of the night, and the bowels were slightly relieved naturally. In the meantime she had had two foot-baths of cold water daily. At the end of a week she was in a state to be packed in the wet sheet, wrung out with warm water; but this was only done once, as, on the second day, it was applied cold, and she laid in it an hour each morning: a cold *wet-sheet rubbing* followed. From the commencement she drank about three tumblers of water a day. The result of this was that the bowels became regular and natural every morning after breakfast, the feet permanently warm, the tongue moist, the pulse soft, and sixty-five. But what struck most forcibly a lady who lived with her for thirty years, was, that in a few days after the first *fortnight*, the calves of the legs had increased remarkably in size, and that flesh had accumulated to some extent over the whole body.

The lady went on with the treatment, packing alternate days, followed by a shallow-bath at 65°, the latter being taken every morning, for three minutes with active rubbing. The abdominal compress was also worn at night, and a greater part of the day. The patient left Malvern, as she said, "a wonder" to herself and friends.

Dr.—After all the nonsense that has been uttered about the *water-cure*, what will our learned friends say, when they find it applied to a case like this, in which every circumstance would seem combined to render it especially perilous?—the previous apoplectic seizure, the tendency to its recurrence, the emaciated state of the body and of the lower limbs particularly—the advanced age of the patient. With such application, however, in an *extraordinary short time, all the secretions are restored to a healthy state*, nutrition is re-established, and the symptoms indicating fulness of the head reduced. It is one of the many instances which might be given of the united safety and potency of this mode of treatment; one such is sufficient to answer volumes of unfounded assertions.

There is now (*March*, 1854) in my establishment a Doctor of Divinity, aged seventy-nine years, a friend of the Rev. R. Barrett's, whose letter has preceded this; his health was restored by the water-cure two years ago in my house. During the late winter, he came to Malvern to be on a visit to his daughter, who was in my establishment, but requiring no treatment himself. When the weather was very cold, from want of care, he was attacked with inflammation of the lungs (*pure pneumonia*). He was attended by Dr. Horner and myself, and soon recovered. The inflammation engaged the lower portion of the lungs on both sides, the *crepitus* and *sputa* were such as we find in acute inflammation. It was a very serious business for a man at his time of life, and who had regularly "drunk his wine" during the "good old days." If he had not done so, I have no doubt that, instead of now showing all the characteristics of *old age*, he would, with the constitution with which nature endowed him, have been a hale hearty man.

THREATENING APOPLEXY, STOMACH AND LIVER DISEASE, ETC.

Dr.—Mr. Shailer called upon me a few days ago with another patient, the Rev. A. Crow, his neighbour. I found the former greatly improved in strength and his general health, and remarkably reduced about the abdomen. At the time he was going through the cure here, and throwing off *fat*, another patient, the Rev. George Burder, who was thin and worn, gained *flesh* rapidly. It so happened that they were going through precisely the same processes in the treatment.

CASE.

"*Dunnington, near Alcester, Warwickshire,*
"*Sept. 29th*, 1843.

"My dear Sir,

"It affords me great satisfaction to add my testimony to that of many others which I know you are constantly receiving as to the efficacy of the water-cure treatment. I entered your establishment on the 29th of May last, in a state of suffering very difficult for me to describe. I will enumerate the following as the principal features of my case: low spirits, costiveness, piles, headache, oppressed with fat, and threatened with *apoplexy*. I had the greatest difficulty to collect my thoughts, my *memory was nearly gone*, and I could scarcely direct my servants. I was in so deplorable a state of health, that I felt, and have since been told, that I was at that time in great danger. It induced me to adopt some prompt measures, having in vain had recourse to medicine. I was led to think favourably of the *water-cure treatment*, by the perusal of one of your books upon the subject, and therefore at once surrendered myself to your care, and during the three weeks I remained in your house, and from that time to the present date, I unremittingly followed your directions; being packed in the wet sheet every morning for one hour, as well as using the shallow-bath, sitz-bath, and compresses, at the same time drinking cold water, and observing the diet recommended by you. And now I have the gratification of stating, that having got rid of about forty pounds of superfluous fat about the stomach, &c., I am nearly relieved from the distressing symptoms I have mentioned above, and entertain fair hopes of having better health than I have known for many years.

"If this expression of my feelings is considered of the slightest use in giving confidence to those under bodily afflictions in the efficacy of the water-cure treatment, I must add that it will give me much pleasure your making use of it, in any way you may think proper.

"And believe me, my dear Sir,
"Very gratefully and faithfully yours,
"Thomas Shailer."

RHEUMATISM TREATED AT THE AGE OF SEVENTY.

CASE.

A gentleman, residing at Leamington, put himself under my care last summer. He had suffered a great many years with rheumatism, and had been treated by all the most noted practitioners with little or no benefit. During the last twenty years he had been forbidden to touch cold water. I found him in the following state: the hands, knees, and feet distorted and enlarged; the patella of each knee firmly fixed and immovable; all the locomotion he was capable of, was a few yards on crutches. For the seven

preceding winters he had not ventured out of his house, and he was carried up and down stairs. A few weeks after he had commenced the treatment by water, he was able to walk a considerable distance with one crutch, and shortly afterwards a stick was found a sufficient support, and he went out in all weathers without any disagreeable result. He left Malvern in the autumn, and returned here to spend part of the summer. He told me that during the winter he had taken a cold-bath nearly every morning, and walked out every day. Many medical men were very angry with him, and a report was raised that he had fallen down in a fit coming out of church, "*the necessary and inevitable result of his morning ablutions!*" His door was crowded with carriages to inquire his fate; so that he was obliged to go and walk about the town to quiet the tumult. In the midst of all this, a little liberality is so *very refreshing*, that I cannot resist recording, that Dr. Jephson, meeting this gentleman walking about the streets of Leamington, said to him, "Well, I do not care how you got so well, or who made you so, I congratulate you on your great improvement." He has not taken a grain or a drop of medicine for the last ten months.

MISCARRIAGE.

DR.—In relating the following case, I must confine myself to the leading facts, as I cannot enter into the details for the non-professional reader. The lady, the wife of a *celebrated sculptor*, was induced to try the water-cure treatment, by her friends, Mr. and Mrs. Calvert, who had been several months in my house. Since then, she has had three children.

CASE.

This patient was suffering from the effects of several successive *miscarriages*. The last of recent occurrence. Some of the symptoms were of a serious nature, and the recumbent posture was found necessary—any movement being accomplished with difficulty, and followed by great exhaustion. Having practised many years as an accoucheur, and been present at the confinement of several hundred ladies, it may be allowed that I have had sufficient experience to form a just opinion in such matters. The treatment at first was gentle, and carefully graduated: it consisted of the tepid wet-sheet rubbing, chilled sitz-baths, and a compress on the abdomen. In a few days, the warm wet-sheet packing, and chilled shallow-bath, with sitz-baths, reduced in temperature and of longer duration. In the second week she could walk about, and used all the baths at the natural temperature, and packing twice a day in the wet-sheet. The third week she was able to use the douche, and could ascend the hills and take prolonged and active exercise. The rapid restoration to health and strength in this case, after so long a period of debility, and lying on couches, &c., was considered extraordinary, and a subject of much congratulation by her friends, and many patients in the house, who had witnessed her previous state of extreme debility.

DR.—Many now go to the water-cure for this distressing disposition alone—for it has been found most successful not only in restoring the patient from the immediate effects, but also in preventing a recurrence. During my long sojourn on the continent, I met with numerous instances both in society and at the different water-cure establishments I visited. This desired change is the result of the patients learning a more efficient and strengthening mode of managing themselves—substituting the stimulus of fresh air, and water properly administered, for the stimulants and seda-

tives and the destructive habits, that are followed by irritation and debility. It will be a grand thing and a blessing, when men get healthy wives, and women, healthy husbands. The following is a letter I received from the lady in question, some time after she had left Malvern. Richard Coxwell, Esq., of Dowdeswell, near Cheltenham, was in my house at the same time with the patient, and was much pleased by reading the letter.

"*Palazzo* ——, *Florence*,
"*Nov.* 10*th*.

"My dear Sir,

"I fear that I have drawn largely on your faith in my promises by my long silence; but although I have deferred the pleasure of writing to you, believe me, the benefit I derived from your advice, and the 'pure wells undefiled' of the Malvern hills, is of too lasting a nature to be erased from my memory, even though it were '*unstable as water*.'

"By strictly persevering in the plan you laid down for me on my leaving Malvern, I have continued in the excellent state of health to which I was restored when I left you, and which I had not enjoyed for years. The elasticity and freshness of spirit, the joyous sense of existence, which I thought gone for ever, have returned to me; my cheek has recovered its bloom, my eye its brightness, and surely you know enough of human nature to feel assured that no woman can be ungrateful for the restoration of her good looks. The ladies ask me what cosmetics I employ, and when I assure them that pure cold water night and morning is the only application I ever make use of, they look incredulous, and give me to understand that they think I am fibbing and determined to keep my own counsel.

"As yet there is no hydropathic establishment in Italy that I am aware of, but, even in this dreamy land, people are by degrees opening their eyes to the great truths embodied in the water-cure. One of the most eminent physicians in Florence has created a great sensation by his successful treatment of nervous fevers on the system of the water-cure. The first essay was in the case of a poor man at the hospital, supposed to be at the point of death. To the astonishment of all parties the patient recovered. The faculty assailed the worthy 'professore' with vituperations and words of 'learned length and thundering sound,' but disregarding the clamour, he acts upon the hint he has received, and in all cases of nervous fever administers the only true medicine. If only one disease is thus treated, it is a great point gained; and it is not likely that a man who has had the courage to take so important a step towards crushing the host of prejudices that envelope the public mind, will be content without pursuing his investigations.

"Our mode of life is very simple, and with the exception of an occasional cigar in which my husband indulges, there is nothing contrary to water-cure doctrines and your injunctions. Mr. ——— is even more enthusiastic on the subject than I am, but I leave him to speak for himself, and with kind regards to Mrs. Wilson, I beg you to believe me,

"Dear Sir, very truly yours,
"—— ——."

"Though the word '*enthusiastic*' used by my wife is an epithet to which I have a certain aversion, I must plead guilty to it this time. I have continued since I left Malvern to practise what you advise for persons in health, and though I always thought myself in the enjoyment of tolerably good health, I perceived soon after I abandoned all irritants, drinking only water, that a 'veil of bile and gall had long hung between me and God's world.' I have gradually gained ever since in the powers both of mind and

body. My occasional colds have come no more, my skin is different, and I feel altogether fresher and younger. If you should have it in your power to write us a word of the health of your family and patients, you would do us a signal favour.

" Very faithfully yours,

" ——— ———."

MERCURIAL LEPROSY.

DR.—The following case presented as beautiful a specimen of the leprosy produced by murcury as I have ever seen; the recovery was rapid.

CASE.

The patient, Mr. P——e, is a gentleman-farmer, and visits Malvern frequently; he came here in July for the water-cure treatment. The chest and abdomen, in fact the whole body, with the upper and lower extremities, were covered in patches with a scaly eruption, and the hands were so bad as to oblige him to have them always covered. On one leg there was a large ulcer of long standing. Before the skin disease made its appearance, he had gone through several courses of mercury. At the end of six weeks he left Malvern without a vestige of the leprosy. The skin was perfectly clean and smooth with the exception of slight discolouration on the arms where the patches of scales had been most abundant.

His general health was also good; he declared himself " quite well in his bodily health." About a month afterwards he called to show me the ulcerated leg, which had also completely healed. He went through all the processes of the treatment, varied from time to time as his symptoms indicated. There was no evident crisis in this case.

BROWN LEPROSY.

A young gentleman, fourteen years of age, son of Mr. F——y, gilder, at Cheltenham, became a patient here in December last. Over the greater part of both legs there existed a scaly eruption, the individual scales being dark in colour, easily detached, about the size of a human nail, and when detached, leaving the surface underneath raw and tender, the latter discharging a bloody serous fluid, until the scales became again formed. This had been going on for a long time, gradually increasing in extent, without the least amelioration. He remained in the establishment nearly thirteen weeks, and left it to return to his father at Cheltenham, with his skin clean and healthy, and all the external appearance and internal signs of a robust state of health. He sweated every other day, and lay in the wet sheet every day, and on alternate days twice. On coming out of the blankets or wet sheet, his attendant, as well as ourselves, witnessed a very strong and peculiar odour emanating from them, and continued for several weeks of the treatment. The regular employment of sitz-baths and of the douche also formed a part of the treatment. Compresses were kept constantly upon the diseased parts, and he took from twelve to fifteen glasses of water daily.

DR.—Here is a case in which the simple operations of the water-cure not only eradicated a local disease which all medical men know and acknowledge to be one of the most difficult, but also brought the patient into robust general health. Compare with this the following list of medicines usually given in this disease, and which *medical writers* tell us are all more or less *uncertain* :—muriatic acid, corrosive sublimate, prepara-

tions of arsenic, caustic potash, white hellebore, &c., all of which, if uncertain to cure the skin, are pretty certain to injure the general health, by establishing disease in the internal organs.

In many skin diseases the water-cure is most marked in its curative effects. In these diseases the results can be seen, and medical men have only to try it to be at once convinced.

HYSTERIA, ETC., WITH EXTREME NERVOUS DEPRESSION, FROM MEDICINAL STIMULANTS.

Dr.—I have extracted the following case from "Life at the Water-Cure," by R. J. Lane, Esq. It is interesting as showing the injurious results of tippling sal-volat: æther, and the different preparations of opium.

(*Extract.*)

"On this day of going to press, the first anniversary of my journey to Malvern, I cannot forbear to quote a case which occurs just in time to give me the pleasure of recording it. A lady reduced to the lowest state of nervous exhaustion, who, when she ventured to leave her home, went in dread of meeting even her dearest friends, who, after a long course of medical treatment, was in a very pitiable state, had been anxiously urged by me to go to Dr. Wilson.

"Not summoning courage to face him, she yet went to Malvern, determined to try the air and the water of the place, and in the hope that rest, regularity of diet, &c., would benefit her. Having been there a fortnight, and her debility and nervous symptoms increasing, she appealed to the Doctor in dread and despair.

"After *three days* of gentle water-cure treatment the scene was changed—the worst symptoms rapidly disappeared; she could smile, and walk, and talk, and experienced not only the soothing and tranquillizing influence of the *wet sheet*, but that exhilaration and confidence that resulted from the annihilation of all her fears and misgivings.

"On the Doctor's third or fourth visit, the patient, like a person awaking from a horrid dream, and asking what she had been doing, said to her maid, 'How many phials have I emptied in the last four months?' '*Forty dozen ma'am.*'

"In eight days—she, who had been too sensitive to speak, even to her relations—who shrunk from the very mention of cold water, and who was scared to terror by the consciousness that she breathed the same air as Dr. Wilson, wrote to me from the Doctor's house (in which she was domesticated), that she had been teazing the Doctor; that when she could not reply to some questions of his, she was delighted to be suspected of an hysterical affection; in short, she gave sure evidence of a return to the light and happy spirit which had only been quelled by long-continued and gathering illness, and by the troubles of the heart.

"It is thus, that all the groundless apprehensions respecting the danger and discomforts of the water-cure are dispelled.

"It is thus that, with alacrity, our nature bounds in quick response to the influence that involves emancipation from the evils of an artificial existence, and that excites to merriment by the *foretaste* of health and peace."

SUPPOSED DISEASE OF THE HEART, WITH NERVOUS DYSPEPSIA, ETC.

DR.—This is another case from Mr. Lane's "Life at the Water-Cure."

(*Extract.*)

"Do I then retract my statement? No—I append *another* case, of a gentleman *who sits next to me* at table, on this Sept. 16th, and who, after some interesting conversation on these vital matters, has, apropos to the matter in question, given me, under his own hand, the following conclusive statement:—

"'Being at Birmingham on business of importance, and having been for some time in a bad state of health, I determined to consult Dr. ——, who is well known. After a careful examination, he pronounced mine to be a case of incurable heart disease. This decision, tatamount to sentence of death, had an alarming effect upon me. The palpitations increased in a violent degree, and sharp pains were felt at the seat of the heart. In spite of whatever resignation and fortitude I was enabled to summon up, anxiety and pain kept me awake all night long,—and I lay arranging in my mind the disposition of my worldly affairs, and communing with myself on subjects still more solemn and essential, when the thought struck me that I was quite unfit to return home to business, I would go to Malvern—give the shattered nerves a few days repose, and hear what Dr. Wilson would say to me.

"'I accordingly left Birmingham by the early train, got here by ten o'clock, saw Dr. W., and after a short interview felt myself wonderfully comforted and assured. He pledged his reputation that there was no disease of my heart—pronounced it to be a strongly marked case of *nervous dyspepsia* of long standing, and assured me it was only one of a great many that come to him, under the same mistaken impression.

"'In the evening I again underwent a thorough examination, the result of which substantiated Dr. Wilson's opinion. I went to bed and slept, and up to the present time, I have gradually improved in health. The excited nervous system is toning down—the palpitations are decreasing, I feel another man, and the Dr. says there is no reason to prevent me enjoying good health for twenty years to come.

"'*Malvern, Sept. 20th*, 1850.'"

SCIATICA, ETC.

LETTER FROM JAMES SHERIDAN KNOWLES, ESQ., AUTHOR OF "THE HUNCHBACK," ETC.

"*Glasgow, Nov. 5th*, 1850.

"MY DEAR SIR,

"I am glad that a new edition of your testimony, in favour of the water-cure, is coming out. You know my opinion of the establishment at Malvern, and the high respect that I entertain for Dr. Wilson, its proprietor and accomplished superintendent, whose patient I had the good fortune to be when I had the pleasure of making your valued acquaintance.

"When I arrived, I could scarcely walk to the turnpike and back again—little more than a few roods from the house; but before I left, I could cut my stick for a trudge of several miles; and for several weeks, almost constantly scaled, before breakfast, that insolent hill in front, which had previously looked down upon me, and successfully defied me to put a foot upon its crest. I entertain no doubt, whatever, that, with the blessing of God, a longer residence would have resulted in the thorough removal of my lameness of many a year.

"So much for my own experience.

"To speak of what passed under my own observation with regard to others:—I witnessed the removal of apoplectic symptoms; subduing of a neuralgic affection of the heart, as well as of pulmonary threatenings; summary expulsion of the gout; a formidable cutaneous disease superseded by a healthy state of the skin: exhaustion from the effects of a residence in India, by indications of rapidly increasing vigour, &c. In short, uniform justification of my previous faith in the admirable system practised at Malvern. If you value this hurriedly drawn up, but honest testimony, make what use of it you please. At all events,

"Believe me,

"Your friend and servant,

"James Sheridan Knowles."

"To R. J. Lane, Esq."

CASE OF A PHYSICIAN, WITH THREATENING PARALYSIS, STOMACH AND LIVER COMPLAINT, AND SKIN DISEASE.

"*Malvern, May* 1, 1854.

"My dear Doctor Wilson,

"Now that your work on the water-cure is on the eve of publication, I request a place in your list of cases, for this brief and hasty account of my own. Being the case of a physician of more than thirty years' experience, in every branch of the profession, it may be deemed worthy of some consideration by my medical friends.

"You may remember when I consulted you in Jan. 1851, I was in extreme ill health and suffering. I had constant numbness and frequent neuralgia of the lower extremities, and other premonitory symptoms indicative of approaching paralysis. I also suffered much from heart palpitation, accompanied with pain of that organ,—these, with frequent nightmare and distressing dreams, compelled me often to resort to any stimulant or anodyne I could soonest find on the occasion. I also suffered much from spasm of the larger muscles. In addition to these evils, there was a congested liver, and congestion also of the abdominal veins, constituting the distressing class of ailments called hæmorrhoidal. All these circumstances led me to think very mournfully of a coming combination of ailments, sufficient indeed to make life comparatively useless,—the thought aroused me to a determined effort for my escape from them.

"From boyhood I had a disease of the skin, of frequent occurrence in this country, and decidedly of hereditary nature. With me it assumed different appearances and degrees of severity, according to circumstances of season of the year, or of habits of life at the time, and of the state of the stomach. It was as lepra or psoriasis in different parts affected at the same time. However it matters not to our present purpose what name correctly belonged to it. In my youthful years I was extremely annoyed at its existence—and I spared no trouble nor expense—and I shrunk from no means, however severe, for its removal. I consulted the most eminent of my professional brethren, and read the most celebrated medical authors on my case, until the time that I became myself a physician. The means of cure prescribed or devised for me consisted, chiefly of drugs —and many of them were the most violent and most noxious ever administered to the stomach of man—amongst such, arsenic, mercury, and iodine, with mineral acids, had a prominent place, and of some of them I took largely and for years! and with other drugs, and especially with preparations of opium, intended indeed for the protection of the stomach and bowels, but which only enabled me the longer, and to a greater degree, to undermine the power of an originally strong constitution. In addition to such internal remedies, I had abundance of external applications, and medicated baths of different

kinds and countries. The result of all my experience of treatment of this kind was unmixed evil, to a serious degree; and I now look back with surprise that I could have proceeded so far and so long. For some time after I had ceased from all treatment of this disease of the skin, I had ceased also to care for it as an annoyance; alas, I did not escape the sad experience that such long drug medication had left unmistakable and indelible traces of its destructive power on my digestive organs and nervous system!

"After many years of active professional duties, I resolved on a partial retirement from the more severe parts of it, because of incapacity from increasing derangement of my nerves. At length I resolved on a consultation with you on my case, and you held out to me the gratifying prospect of a cure. I commenced with a mind made up to do my part, and under the full conviction that, if this system of the water-cure, founded I saw, on the correct basis of physiological principle, failed in my case, all other human means would fail also. Thanks be to God, I had not long to remain in doubt on the question: a few weeks brought the grateful assurance to my mind that I should eventually be rid of my complication of maladies. By strict perseverance in carrying out the system of cure you laid down for me, in four months a very great and welcome change was effected in my state of feeling and of health. A few months more of active treatment completed my restoration to a degree of physical strength and vital energy which I only possessed twenty years ago. I have now, in addition to my cure, the gratifying retrospect of more than two years of the most usefully spent time of my life, in studying the water-cure practice in your establishment.

"I remain,

"Yours sincerely,

"JONAH HORNER, M.D."

P.—When you have had the good fortune to cure a good many "experienced physicians," who have tried other methods in vain, it is to be hoped that your profession will begin to study the water-cure, and adopt its valuable resources in their private practice.

DR.—I could have adduced many more cases of equal interest with those before you, showing the results of the water-cure treatment—different forms of paralysis and skin diseases—nervous deafness—threatening amaurosis—and simple tumours, particularly of the breast—but these, and others, I shall reserve for another work, which at my leisure I intend to publish, in the form of Andral's *Clinique Médicale*.

APPENDIX.

TABLE I.

Showing the Mean Time of Digestion of the different Articles of Diet, naturally in the Stomach, and artificially, in Vials, on a Bath.

The proportion of gastric juice to aliment, in artificial digestion, was *generally* calculated at one ounce of the former to one drachm of the latter, the bath being kept as near as practicable at the natural temperature, 100° Fahrenheit, with frequent agitation.

Articles of Diet.	Mean Time of Chymification.			
	In Stomach.		In Vials.	
	Preparation.	H. M.	Preparation.	H. M.
Rice	Boiled	1		
Pig's feet, soused	Boiled	1		
Tripe, soused	Boiled	1		
Eggs, whipped	Raw	1 30	Whipped	4
Trout, salmon, fresh	Boiled	1 30	Boiled	3 30
Trout, salmon, fresh	Fried	1 30		
Soup, barley	Boiled	1 30		
Apples, sweet, mellow	Raw	1 30	Masticated	6 45
Venison steak	Broiled	1 35		
Brains, animal	Boiled	1 45	Boiled	4 30
Sago	Boiled	1 45	Boiled	3 15
Tapioca	Boiled	2	Boiled	3 20
Barley	Boiled	2		
Milk	Boiled	2	Boiled	4 15
Liver, beef's, fresh	Broiled	2	Cut fine	6 30
Eggs, fresh	Raw	2	Raw	4 15
Codfish, cured dry	Boiled	2	Boiled	5
Apples, sour, mellow	Raw	2	Masticated	8 30
Cabbage, with vinegar	Raw	2	Shaved	10 15
Milk	Raw	2 15	Raw	4 45
Eggs, fresh	Roasted	2 15		
Turkey, wild	Roasted	2 18		
Turkey, domestic	Boiled	2 25		
Gelatine	Boiled	2 30	Boiled	4 45
Turkey, domestic	Roasted	2 30		
Goose, wild	Roasted	2 30		
Pig, sucking	Roasted	2 30		
Lamb, fresh	Broiled	2 30		
Hash, meat and vegetables	Warmed	2 30		
Beans, pod	Boiled	2 30		
Cake, sponge	Baked	2 30	Broken	6 15
Parsnips	Boiled	2 30	Mashed	6 45
Potatoes, Irish	Roasted	2 30		
Potatoes, Irish	Baked	30		

TABLE I.—*continued.*

Articles of Diet.	Mean time of Chymification.			
	In Stomach.		In Vials.	
	Preparation.	H. M.	Preparation.	H. M.
Cabbage, head	Raw	2 30	Masticated	12 30
Spinal marrow, animal.	Boiled	2 40	Boiled	5 25
Chicken, full grown	Fricassed	2 45		
Custard	Baked	2 45	Baked	6 30
Beef, with salt only	Boiled	2 45		9 30
Apples, sour, hard	Raw	2 50	Entire pieces	18
Oysters, fresh	Raw	2 55	Raw, entire	7 30
Eggs, fresh	Soft boiled	3	Soft boiled	6 30
Bass, striped, fresh	Broiled	3		
Beef, fresh, lean, rare	Roasted	3	Roasted	
Beefsteak	Broiled	3	Masticated	8 15
Pork, recently salted	Raw	3	Raw	8 30
Pork, recently salted	Stewed	3		
Mutton, fresh	Broiled	3	Masticated	6 45
Mutton, fresh	Boiled	3		
Soup, bean	Boiled	3		
Chicken soup	Boiled	3		
Aponeurosis	Boiled	3	Boiled	6 30
Dumpling, apple	Boiled	3		
Cake, corn	Baked	3		
Oysters, fresh	Roasted	3 15		
Pork, recently salted	Broiled	3 15		
Pork-steak	Broiled	3 15		
Mutton, fresh	Roasted	3 15		
Bread, corn	Baked	3 15		
Carrot, orange	Boiled	3 15	Mashed	6 15
Sausage, fresh	Broiled	3 20		
Flounder, fresh	Fried	3 30		
Catfish, fresh	Fried	3 30		
Oysters, fresh	Stewed	3 30	Stewed	8 25
Beef, fresh, lean, dry	Roasted	3 30	Roasted	7 45
Beef, with mustard, &c.	Boiled	3 30		
Butter.	Melted	3 30		
Cheese, old strong	Raw	3 30	Masticated	7 15
Soup, mutton	Boiled	3 30		
Oyster soup	Boiled	3 30		
Bread, wheat, fresh	Baked	3 30	Masticated	4 30
Turnips, flat	Boiled	3 30		
Potatoes, Irish	Boiled	3 30	Mashed	8 30
Eggs, fresh	Hard boiled	3 30	Hard boiled	8
Eggs, fresh	Fried	3 30		
Green corn and beans	Boiled	3 45		
Beets	Boiled	3 45		
Salmon, salted	Boiled	4	Boiled	7 45
Beef	Fried	4		12 30
Veal, fresh	Broiled	4		
Fowls, domestic	Boiled	4	Masticated	6 30
Fowls, domestic	Roasted	4		
Ducks, domestic	Roasted	4		
Soup, beef, vegetables, and bread	Boiled	4		
Heart, animal	Fried	4	Entire piece	13 30
Beef, old, hard, salted	Boiled	4 15		
Pork, recently salted	Fried	4 15		
Soup, marrow bones	Boiled	4 15		
Cartilage	Boiled	4 15	Masticated	10
Pork, recently salted	Boiled	4 30	Masticated	6 30
Veal, fresh	Fried	4 30		
Ducks, wild	Roasted	4 30		

TABLE I.—*continued.*

Articles of Diet.	Mean Time of Chymification.			
	In Stomach.		In Vials.	
	Preparation.	H. M.	Preparation.	H. M.
Suet, mutton	Boiled	4 30	Divided	10
Pork, fat and lean	Roasted	5 15		
Tendon	Boiled	5 30	Masticated	12 45
Suet, beef, fresh	Boiled	5 30	Entire piece	12
Beef-steak	Broiled		Cut fine	8
Beef-steak	Raw		Cut fine	8 15
Beef	Boiled		Entire piece	9
Mutton, fresh	Broiled		Unmasticated	8 30
Cream			Raw	25 30
Cheese, old, strong			Entire piece	18
Cheese, new, mild			Divided	8 30
Oil, olive			Raw	60
Tendon			Entire piece	24
Cartilage			Divided	12
Bone, beef's, solid			Entire piece	80
Bone, hog's, solid			Entire piece	80
Parsnips	Boiled		Entire piece	13 15
Parsnips	Raw		Entire piece	18
Carrot, orange			Entire piece	12 30
Carrot, orange	Raw		Raw piece	17 15
Potatoes, Irish			Entire piece	14
Cabbage	Boiled	4 30	Boiled	20
Peach, mellow			Cut small	10
Peach, mellow			Mashed	6

The foregoing table is formed from all the experiments made upon St. Martin, since 1825, taking the average from such as were generally performed under the naturally healthy condition of the stomach and ordinary exercise.

The mean times of artificial chymification have been taken from such experiments as were generally made with the pure gastric juice, or such as was too slightly vitiated to impair its solvent effect in any essential degree.

They exhibit the average, as near as practicable, for the digestion of one drachm of alimentary matter, in one ounce of gastric juice, or in about that proportion, counting the time actually kept on the bath, or in the axilla.

Exceptions, however, must be made for the bone, oil, cream, and one or two other articles, which chymify much slower and more difficultly than the less concentrated aliments.

Several experiments have been omitted, especially when they were of the same kinds, and produced similar results.

TABLE II.

Showing the Temperature of the Interior of the Stomach in different Conditions, taken in different seasons of the Year, and at various times of the Day, from 5 o'clock in the morning till 12 o'clock at Night.

Date.	Wind.	Weather.	Thermometer.	Temperature and Condition of Stomach.				
				Empty.		During Chymification.		
				Repose.	Exercise.	Repose.	Exercise.	
1829.				°	°	°	°	
Dec. 6	S.	Cloudy and damp	63	98				
7	N.W.	Do. do.	27	98				
8	S.W.	Clear and dry	13	99				
9	W.	Clear	10	99				
1830.								
Jan. 21	N.W.	Do. and cold	0·8	100				
25	S.W.	Do.	2	100		100		
March 17	S.W.	Rainy	38	99				
18	N.W.	Clear	6	100			102	
19				98				
1832.								
Dec. 4	N.W.	Snowing	35		101			
5			30	100			101½	
6			38	100				
7			28	99		100		Stomach morbid
8		Cloudy and damp	46	99		99		Stomach morbid
13				100				
14				100				Stomach morbid
15				100				Stomach morbid
22				100		100		
23				100	101			Stomach morbid
25	E.	Variable	31	100		100	101	Stomach morbid
26	N.E.	Cloudy and damp	38	99½	101	90½	101	
27	E.	Foul and damp	38	99½		100		
...	S.	Clear	62	100		100		
28	N.	Do.	34	100				
29	N.W.	Do.	34	100		100		
30	...	Do.	26	100				
31	S.	Cloudy and damp	30	100½				Stomach morbid
1833.								
Jan. 1	S.	Rainy	50	100				
3		Clear	38		101½			
7	N.E.	Cloudy and damp	48	100				
11	S.W.	Clear	15	100				
13	Calm	Cloudy and dry	12	100	101	100	100½	Stomach morbid
14	N.W.	Clear	28	100			101½	
15	N.E.	Cloudy and dry	35	100	101			
17	N.W.	Clear and dry	19	100		100	102	Stomach morbid
23	N.E.	Rainy	39	100½			101¾	
24	N.	Cloudy and damp	39	100½	101¼			
...	N.E.	Rainy		99½				After sleeping
25	S.		36	99				Before rising
...			38	100½			102	
26	N.W.	Clear	36	100½		100¾	101	99½ after sleeping
27	Calm	Cloudy	32	99½			101¼	99½ before rising
28	S.W.	Clear	35	101*			101½	
...	S.W.	Do.	46	101½		100½		
...				101½		100½		

* At this and the subsequent examinations the bulb of the thermometer was placed three or four inches nearer the pylorus than before, and exhibited an increase of temperature indicating a difference of three-fourths of a degree between the splenic and pyloric extremities.

TABLE II.—*continued.*

Date.	Wind.	Weather.	Thermometer.	Temperature and Condition of Stomach.				
				Empty.		During Chymification.		
				Repose.	Exercise.	Repose.	Exercise.	
1833.								
Jan. 29	N.E.	Clear	28	100¾	101½		102	100 before rising
30	N.E.	Cloudy and damp	39	99½	101½	100¼	102	99½ before rising
31	N.W.	Rainy	45	101¼	101½	100¾		100 before rising
Feb. 1	N.W.	Clear	28	101			102	100 before rising
March 26		Do.		100½			101	
July 9	W.	Cloudy and damp		100				Before rising
10	W.	Clear	63	100	101			
11	N.E.	Cloudy	65	100	101			
12	W.	Clear	70	100½	101¾			
13	Calm	Do.	69	100¾	101¼			
14	S.	Variable	75	100	102			
15	W.	Clear	74	100	102			
...	W.	Do.	74	100½			101¾	
16	W.	Cloudy	73	101	101½			
28	N.W.	Clear	66	101				
Oct. 10	W.	Fair	61	100	101½		101½	
...	S.	Rainy	61		101¾	102	103	
11	N.W.	Fair	32	100	102		102	
...				101¾		101¾		
12	S.	Cloudy	36	101		101		
13	N.E.	Rainy		101		101	102	

TABLE III.

Representing the Average Quantities of Dry Matter, Moisture, Carbon, and Nitrogen, in various Alimentary Substances.

100 Parts.	Solid or Dry Matter.	Water or Moisture.	Carbon.	Nitrogen.	Authority.
Gum Arabic	87·6	12·4	36·3	0	Prout
Ditto	82·4	17·6	34·78	0·14	Guerin
Sugar candy	89·47	10·53	42·09	0	Peligot
Ditto			42·85	0	Prout
English refined sugar	..	..	41·5 to 42·5	0	Prout
Maple sugar			42·1	0	Prout
Beet-root sugar			42·1	0	Prout
East India moist sugar			40·88	0	Prout
Sugar of Narbonne honey			36·36	0	Prout
Sugar from starch [potato sugar?]			36·2	0	Prout
Sugar of milk			40·0	0	Prout
Ditto (crystallized)	87·5	12·5	40·46	0	Liebig
Manna sugar (*Mannite*)			38·7	0	Prout
Ditto			39·85	0	Liebig
Potato starch (commercially dried)	82	18	36·44	0	Dumas
Fine Wheat starch	85·2	14·8	37·5	0	Prout
Arrowroot	81·8	18·2	36·4	0	Prout
Almond oil	100	0	77·403	0·288	Saussure
Olive oil	100	0	77·50		Saussure
Butter	100	0	65·6	0	Berard

TABLE III.—*continued.*

100 Parts.	Solid or Dry Matter.	Water or Moisture.	Carbon.	Nitrogen.	Authority.
Hog's lard	100	0	79·098	0	Chevreul
Mutton suet	100	0	78·996	0	Chevreul
Wheat	85·5	14·5	39·415	1·966	Boussingault
Rye	83·4	16·6	38·530	1·417	Boussingault
Oats	79·2	20·8	40·154	1·742	Boussingault
Oatmeal	93·4	6·6			Christison
Bread (Rye) average	67·79	32·21	30·674		Bœchmann
Ditto ditto			30·15		Liebig
Leguminous seeds ditto			37·00		Liebig
Peas	84·0	16·0	35·743		Playfair
Ditto *Pois jaunes*	91·4	8·6	42·4	3·838	Boussingault
Ditto	85·94	14·06			Einhof
Beans	85·89	14·11	38·24		Playfair
Ditto (*Broad or Windsor Bean*)	84·37	15·63			Einhof
Lentils	84·1	15·9	37·38		Playfair
Potatoes	24·1	75·9	10·604	0·3615	Boussingault
Ditto (fresh)	20·6	79·4		0·37	Boussingault
Ditto (fresh)			12·2		Liebig
Ditto (kept 10 months)	23·2	76·8		0·28	Boussingault
Cabbage	7·7	92·3		0·28	Boussingault
Turnips	7·5	92·5	3·2175	0·1275	Boussingault
Carrots	12·4	87·6		0·30	Boussingault
Jerusalam Artichoke	20·8	79·2	9·0	0·3328	Boussingault
Apricot (ripe)	25·13	74·87			Berard
Green-gage (ripe)	28·90	71·10			Berard
Peach (ripe)	19·76	80·24			Berard
Cherries (ripe)	25·15	74·85			Berard
Pear (ripe Jargonelle)	16·12	83·80			Berard
Gooseberries (ripe)	18·90	81·10			Berard
Smyrna figs	84·00	16·00			Bley
Cucumber (peeled)	2·86	97·14			John
Blood	20·00	80·00	10·392	3·041	Liebig
Milk, cow's	12·98	87·02	...	...	O. Henri and Chevallier
„ ass's	8·35	91·65	...	...	
„ woman's	12·02	87·98	...	...	
„ goat's	13·20	86·80	...	...	
„ ewe's	14·38	85·62	...	...	
Butcher's meat, devoid of fat	26	74	13·6		Liebig
„ „ with 1-7th fat and cellular tissue			21·75		Liebig
„ „ including bones, as purchased	29	71			Liebig
Fresh beef flesh	25	75	12·957	3·752	Bœckmann
Muscular flesh of ox	22·5	77·5			Schlossberger
„ „ calf	20·3 to 21·8	79·7 to 78·2			Schlossberger
„ „ pigeon	24·0	76·0			Schlossberger
„ „ chicken	22·7	77·3			Schlossberger
„ „ carp and trout (average)	19·7	80·3			Schlossberger
„ „ cod, haddock, & sole (average)	20·0	80·0			Brande
Egg, white of	20·0	80·0			Bostock
„ yolk of	46·23	53·77			Prout
„ dried & purified albumen of			55·00	15·681	Scherer
Calf's sweetbread	30·0	70·0			Morin
Oysters	12·6	84·0			Pasquier
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Barley	130	Ditto, dried at 212°	83
Oats	117	Potatoes	613
Rye	111	Ditto, kept 10 months	894
Rice	177	Ditto, dried at 212°	126
Buck-wheat	108	Carrot	757
Maize, or Indian corn	138	Ditto, dried at 212°	95
Horse-beans	44	Jerusalem artichoke	539
Peas	67	Turnips	1335

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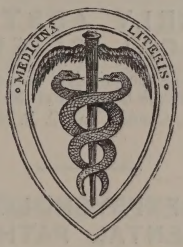

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